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VOL. XIV. NEW YORK, AUG. 24, 1889. No. 8

An Electrical Conference for 1892. WE publish this week an important notification from Secretary R. W. Pope, with regard to the International Electrical Conference which the American Institute of Electrical Engineers proposes to hold in this country in connection with the World's Fair of 1892. The plan is an excellent one and deserves universal support.

A Word from President Weeks. WE think that the frank and manly letter from President Weeks in our issue this week, on the rulings of the chair at the late Niagara Falls meeting of the National Electric Light Association, will render clear his ideas and opinions as to the points then raised. Mr. Weeks makes out a good case, though, even if he could not do so, no one would impugn his sincerity and straightforwardness in the effort to get matters right amid confusing conditions and circumstances.

Green and Wanamaker. THE best of the battle lies evidently with Dr. Green in his contention on behalf of the Western Union Company that the Postmaster General has no right to impose a one-mill rate for government business. The same rate applied to all the messages handled by the Western Union Company would yield about a quarter of a million dollars annually, whereas the company's expenses run about fifteen million dollars per annum. The logic of such figures is too much for Mr. John Wanamaker.

The Edison Convention. ALTHOUGH the Edison Association sits with closed doors, a very full and interesting report of its proceedings at Niagara Falls last week will be found in this week's issue. It will be seen that some valuable papers were read and that important statements were made in regard to the status and development of the Edison lighting business.

The Census and Electrical Statistics. NOW that the time for census taking approaches, the desirability of the collection of special statistics in regard to electricity becomes more and more apparent. There are to-day no official statistics whatever in this country as to the magnitude of the various electrical industries, and the want of them is often badly felt. We are glad that the National Electric Light Association has given the matter attention by requesting that Mr. A. R. Foote be appointed specially to gather the required electrical data. Mr. Foote is well qualified for the work, and we trust that he may be selected.

Profit in Motor Work. THE question: "What profit is derived from selling current for operating electric motors?" was recently put to the superintendent of a well-known electric light and power station furnishing current to about 125 h. p. in small motors. His answer was, 38 per cent. net profit on the original investment, Part of his daily expense account for operating the motors only, is made up as follows: Coal, $9; water, $1.20; waste and oil, 10 cents; sundries, $3; labor, two men, $4. It is evident that the profit lies largely in the fact that the motors are numerous and small. The same quantity of current supplied to, say, four large motors of 30 h. p. each would not yield any such return. But even then there would be a much better margin than is suspected by those who have not yet looked into motor problems, or noted how remarkably the varying call for current practically doubles the capacity of the plant for motive power purposes.

The Thomson Induction Experiments. THE article that we publish this week on the induction experiments shown by Prof. Elihu Thomson at the Paris Exposition will, we think, be read with very general interest. Of their wonderful suggestiveness there is no need to speak. It is only time that can bring to solution many of the problems they hint at and furnish the useful applications that they promise. The statements made by M. Hospitalier convey a fair idea of the experiments as a whole; but there are countless little points that are apt to escape casual notice, yet each of which is as full of interest as a page of Faraday. Thus we understand, for example, that a curious property of the balanced coil and lamp is that it keeps the same brilliancy in the lamp notwithstanding changes of force in the inducing current. The liquid could be replaced (which has been done by a lever and counterpoise) with a similar result of weighing the repulsive action for constancy of light in the lamp, or for giving different amounts of energy to the lamp by changing the balancing weight.

The New York World's Fair. DURING the present week some action will probably be taken to place an electrical representative on the organizing committee. There is practically no change in the situation since in noting the various nominations made to the Mayor, we took occasion to commend the choice of Dr. Otto A. Moses by the National Electric Light Association, as a man eminently fitted for the place. We venture, however, to point out that the great art and science of electricity will receive no more than its due if it be given three or four representatives. When we find that "Shipping," "Domestic Steamships" and "Foreign Steamships" have each a sponsor, and that "Iron," "Hardware," "Machinery," "Plumbing and Steam Fitters," and "Mechanical Engineers," are each recognized by themselves, it is proper to request that the great distinctive departments of the telegraph, the telephone, the electric light, electrical engineering and electrical manufacturers in general be each treated with like consideration. Electricity will be the greatest feature of novelty and interest at the Fair, and needs abundant representation by strong men.

Hickenlooper's Conversion. TIME was when Gen. Hickenlooper could not say anything too strong against the electric light. At one period the gallant general had a literary bureau which devoted itself to gathering reports of accidents to electric light plants, and he even collected these items in a neat little brochure that is most amusing and entertaining. But Saul is once again numbered with the prophets, and we are able to present our readers, in this issue, with a signal proof of the thoroughness of Gen. Hickenlooper's conversion. We publish the plans for the Hickenlooper electric light station for Cincinnati, and it will be noted that it is in contemplation to duplicate the station at no distant date After all, one must like the pluck and readiness with which Gen. Hickenlooper thus signalizes his change of front, and we are glad to welcome to the electrical ranks a man of his ability and deserved prominence. The only pity is that others who were just as bitter in their opposition to the electric light in its days of struggle and imperfection have not, like him, yielded to its influence, but have hardened their hearts. They will be sorry for it one of these days.

The Telephone and Electric Railways. THERE is a possibility that the National Telephone Exchange Association at its meeting in Minneapolis may come out strongly in favor of some measure recommending the appointment of a State official empowered to settle all differences that may arise between the local electrical companies in any town or city, and thus do away with all need of the expensive litigation with electric light or electric railway companies so frequently reported of late. The telephone companies being first in the field after the telegraph, having large vested rights, and having built model circuits and stations, assert that it would be a mere act of justice and good faith on the part of the respective city councils to refer to such an official a copy of all ordinances presented for the guaranteeing of rights and privileges to electrical organizations, in order that he might suggest such additions or amendments as would be deemed necessary to guard both the interests of the city and to treat justly and fairly all established electrical industries. It goes without saying that the advice of such an official would be of value to many city councils, some of which are prone to rush through every ordinance that is properly presented, irrespective of the fact that if the privileges granted therein are actually enjoyed to their fullest extent they will not only restrict, but actually destroy the efficiency of other branches of electrical industry that may have been in peaceful possession of certain rights for years, and on the anticipated continued enjoyment of which capitalists have been induced to lend their aid to the enterprise.

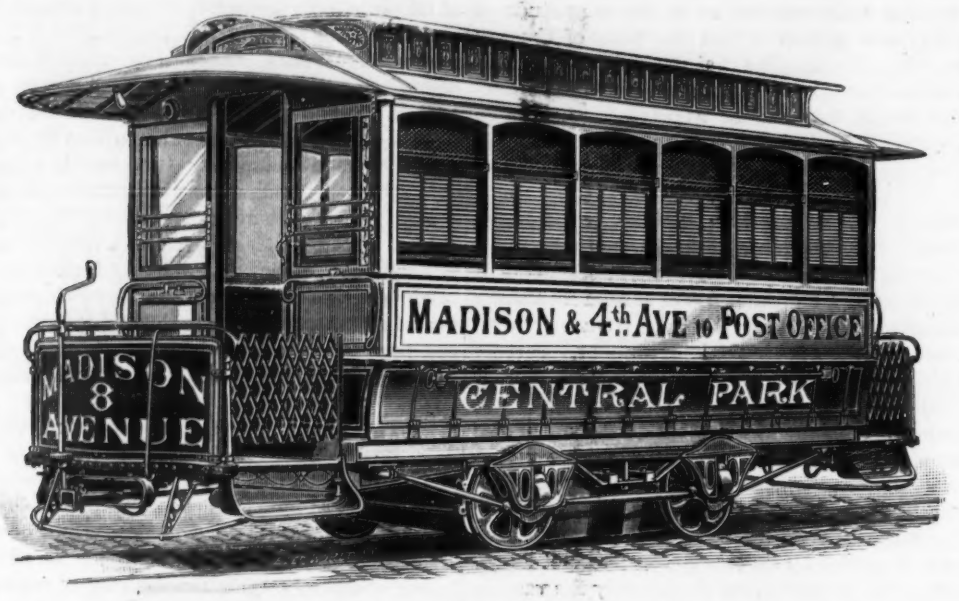
A Profitable Investment. WHAT may be accomplished in many cities by the exercise of first-class management on the part of the superintendent and the entire absence of interference on the part of the stockholders, is forcibly shown in the evidence recently brought out in the settlement of a claim against an electric light and power company established in a city of over 100,000 inhabitants. Some five years ago the company was formed, contracts were signed, and the stockholders assessed $80,000 in actual cash to pay for the complete installation, which was then placed in the charge of a young man of known ability, to whom no other instructions were given than to secure the largest possible dividends. The capital stock was then $100,000; within two years it was doubled, and later on was raised to $300,000, though the stockholders have never paid in a dollar other than the first subscription of $80,000. An offer of $260,000 in spot cash has been made for the complete plant, and the average yearly net profits divided during *each* of the last four years has equaled the *original cost* of the plant. In other words, were they to sell out to-day for the sum named they would have received a total of $580,000 upon an investment of $80,000 made some five years ago, These statements may appear wild, and we do not vouch for them, but the substance of what is here given was sworn to as facts. Is it to be wondered at that capitalists stand ready to invest in any legitimate electrical enterprise? Should the unprecented activity in electrical circles be matter of wonder? Even if arc lights do not earn as much now as they did five years ago, the industry is evidently one capable of good returns.

The Electrical Conduits of New York. AT the meeting of the Board of Electrical Control last week, the interest naturally centered in the report presented by Thos. G. Gilroy, Commissioner of Public Works, and Daniel L. Gibbens, Commissioner of Electrical Control, the committee appointed for the purpose of drawing up a report upon the investigation made of the explosions in the electrical subways at the corner of Twenty-third street and Fifth avenue, The committee stated that the explosions were caused by the rapid accumulation of illuminating gas in the manholes of the electrical subway from a leak in the gas mains adjacent thereto, which illuminating gas was ignited presumably by a spark resulting from the atmospheric differences of temperature, or by a flame carried backward through the distributing duct leading from the subway into the cellar of a store in the Fifth Avenue Hotel building, which distributing duct had been left unclosed. It does not appear that the explosions were caused by any leak from the electrical conductors in the subway, inasmuch as the evidence before the board shows that no current had been turned on these conductors at the time of the explosion. The conclusion arrived at from the investigation is that such explosions are primarily due to escape of gas, and may occur as well in the telephone or telegraph subway as in the electric light subway, and may also occur in sewers, house vaults or other confined spaces in which illuminating gas may accumulate. The committee suggest various obvious remedies, but they fall back finally upon the blowers already in use. They consider the gas companies to blame for the trouble, and fix the responsibility there. They recommend that some competent municipal board be appointed to supervise all underground work of whatever character, after the manner of the Board of Electrical Control, to prevent the incessant annoyance to the public from leaks, breaking up of the streets, explosions and other troubles. What the electrical companies want is less interference, not more, but perhaps they would be better treated if there were a comprehensive system of underground control.

The New Julien Electric Car.

The car illustrated on this page is the new storage battery car of the Julien Electric Traction Company, and has been specially designed for the Fourth avenue road, embodying all the improvements suggested by this company's long and successful application of the storage battery for electric traction purposes over the above road. The car is very handsome, and is tastefully constructed and finished, surpassing in comfort all previous attempts in the line of electric cars.

This standard type is made with a 16-foot body, supported on an independent, rigid truck, with a 6-foot wheel base, weighing, with motor, gearing and one set of batteries, about 7 tons. This, however, varies in accordance with the weight of batteries required to suit the requirements of each particular road. The car body is perfectly independent of the truck, and can be quickly removed to make repairs or for inspection. The motors are two in number, one on each axle, and each of 10 h. p. capacity; this being a suitable power for ordinary street car work, where the grades do not exceed 5 or 6 per cent. and are not over 800 feet in length. The current is supplied by two sets of batteries, each set containing 108 cells, one set being charged while the other is in service, the change between the two being effected in from 4 to 8 minutes. The cells are placed in six trays on each side of the car, and are inserted in it by pushing them from the outside through the open panels under the seats. The batteries are generally so proportioned that the amount of energy contained is at least double that required for each trip. The system of battery shifting devices employed enables 15 cars to be operated from one battery rack, which occupies a floor space of 24 feet by 7 feet on each side of the car. The stall room for 135 to 150 horses (9 or 10 horses to the car) would be 5,400 square feet. Each car requires from 6½ to 8 h. p. for generating machinery, depending on the number of cars in operation. The car is operated from either end by means of a "regulator," the speed being varied at will. A special and powerful brake apparatus is used on all cars, but in cases of emergency the regulator is reversed, and the car stopped suddenly by electric power. The cars are lighted by electricity and the warning gong is also sounded by the same agency.



JULIEN STORAGE CAR, AS ADOPTED FOR NEW YORK CITY.

The cars on the Madison & Fourth avenue line absorb one electrical horse-power hour per mile. This road has some long gradients, the one at Centre street being 600 feet in length, and the grade over 4½ per cent. On this road the cars are furnished with 108 cells of battery which, with the containing rubber cells and trays, weigh about 3,800 pounds, and have a capacity of 35 electrical horse-power hours. The speed of these New York cars is from 9 to 10 miles an hour on the level. The cars can be geared to run much faster for suburban traffic, but the ordinary demands of city traffic call for no greater speed, especially when the cars run between horse cars.

It has been adequately shown, during the last six or eight months, that these cars are capable of performing efficient service, and that the system is practical, reliable and economical; so that the Julien Electric Traction Company will guarantee their cars to do efficient service, and that the cost of motive power will not exceed that of horse traction.

Car No. 7, which was placed in regular passenger service on Feb. 23, 1889, ran, up to June 22, 6,706½ miles. Being assured, by the working of the above car, that the standard of efficiency and reliability aimed at had been obtained, work was commenced on building thirty new cars at the works of the John Stephenson Company, twenty of which are now being put in service on the Fourth & Madison avenue line, in this city. The reliability of the system is well shown, for since the cars began to take passengers, on Sept. 15 last, they have never broken down, but have always returned to the station with their own power. Mr. Alfred Skitt, the superintendent of the New York & Harlem Railroad Company, states that his company are well pleased with the operation of the Julien cars, and especially with the very marked improvement in the new cars, and that there is no longer any doubt concerning the economical working of storage battery cars. They propose to thoroughly test the system during the coming winter.

Those who have not seen the cars work in ice and snow will understand the reason of their success when attention is called to the fact that these cars are simply locomotives. Their weight gives them adhesion, and the enormous amount of stored energy at the disposal of the driver, propelling power. In addition, the batteries being grouped in several series, the driver is enabled to increase the pressure from 54 to 216 volts.

With reference to cost of operation, motive power is estimated at $3.40 for a car day of 75 miles; that is to say, the cost of energy is two cents per horse power hour, and $700 per annum for maintenance of batteries and motors. As regards the life of the battery there is no reason why the two sets should not last two years. The chief element of cost, the raw material, remains to be made over again into new batteries, and the mechanical devices for manufacturing the elements have so reduced the cost of manufacture, that that item of expense no longer threatens the economy of the system. The more level the road, the cheaper the system. The cost of generating machinery per car will vary with the number of cars in operation. If no more than twenty cars are to be operated, an allowance of $1,000 per car must be made for machinery and shifting devices. If the current is purchased from a central station this item is dispensed with. In conclusion, it is worthy of note that the system may be introduced gradually, side by side with horse traction, thus avoiding heavy initial outlay; also the ordinary horse cars may be altered to suit the system, although new cars specially adapted for the purpose are decidedly to be preferred.

Telegraphy in the Holy Land.

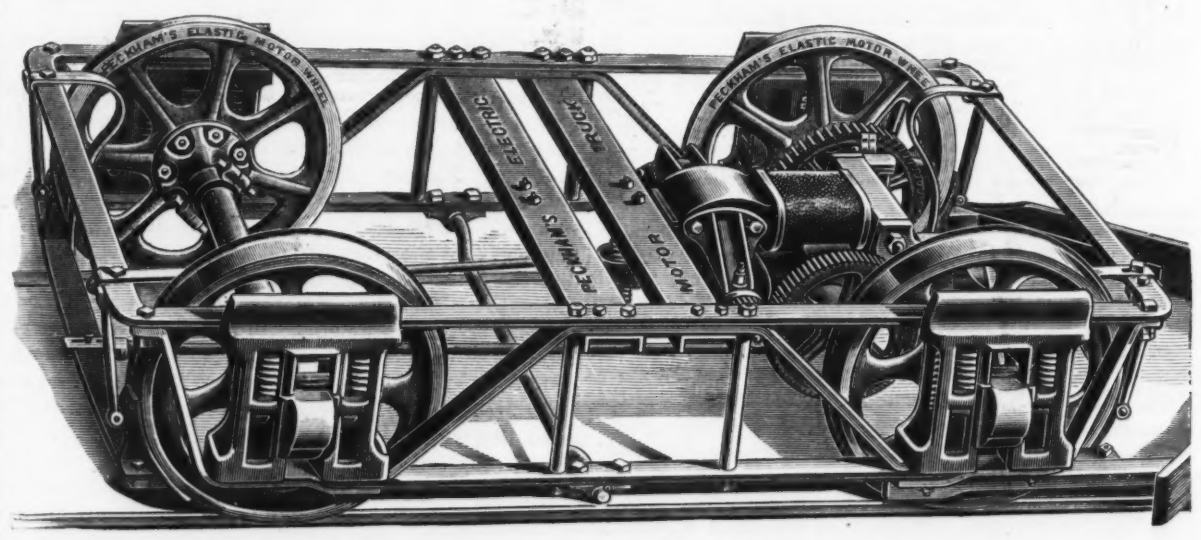
The following interesting little note of travel comes from a newspaper correspondent in Palestine:

Nablus has become so far modernized as to have a telegraph. But even telegraphy is a very slow kind of machinery in the East and sorely tries the patience of the Western mind habituated to methods of expedition. A wire runs to Jerusalem. On the night of arrival, our drago-man desired to send a message to the holy city for four additional guards to meet us the next evening at Bethel. The message was sent to the office, but returned an hour later to our tents with the instruction that a new one should be written, as the paper sent contained several alterations and erasures. A second was sent, but this also was returned by the fastidious Turkish operator on the ground that it was written on yellow paper, and all messages must be written on "clean paper." Our guide, Mordecai, with considerable excitement, after expressing himself in Arabic for the benefit of ears not our own, exclaimed in pure English, "What the man wants is money. The kind of paper makes no difference. He wants to force me to give him something." The message was received at the third attempt, and cost $5. It reached its destination in time, for on the following evening we found our four brave guards awaiting us at Bethel. In the East time is the cheapest of all commodities, and money scarce. Tourists learn, after they have vexed their righteous souls to weariness, to fall into the fashions of the country and put up with vexations and unnecessary delays, and to pay out money where no services are rendered.

Peckham's Electric Motor Truck.

We publish on this page a view of Peckham's new electric motor truck. It has been the custom to suspend the motor by means of bearings around the axle at one end and at the other by a flexible bearing supported at the bottom of the truck on crossway angle irons, the reason for this being to allow the motor itself to follow curves and grades without undue strain on the gearing. In the new truck shown in the cut a very important improvement has been made in suspending the motor from overhead, it thus being absolutely free to move in accordance with the relative motions of the truck. The motors, either one or two, as the case may be, are hung from the crossway angle bars by flexible joints, enabling the suspended motor to adjust itself perfectly to any position, and prevent altogether the jars and shocks which it might receive when rigidly secured to the bottom of the truck in the usual manner. To provide the truck with the necessary strength to support one-half the weight of the two motors, the side frames are supported by a regular bridge truss, this construction giving the greatest possible strength with the least weight of metal—another radical improvement over the older forms, in which simple bolts were used. By reason of this bridge truss construction it possesses, it is claimed, greater strength than any other motor truck, and is, at the same time, so designed that the armatures can be readily removed when desired. without disturbing car body or truck. Also, by the removal of a single nut the motor can be suspended from the axle, if necessary, for repairs.

Although the truck is designed for suspending motors from overhead by flexible joints if desired, the motor may be suspended from the bottom plate of the truss, since this plate is in turn supported from overhead by the truss. When supported from underneath, the difficulties encountered in older forms, are overcome in the following ingenious manner. The cross bars, which support the motors, are provided at each end with round ends, that fit loose in sockets attached to the underside of the supporting bars. Being supported by these loose or adjustible bearings, the motor supporting bars can yield with the motor in stopping and starting cars.



THE PECKHAM ELECTRIC MOTOR CAR TRUCK.

The manner in which the motor is secured to the suspended eye bar, from the overhead frame of the truck, and the method of securing the truss frame to the pedestal of the car boxes, is such that each motor, and the axle and wheel to which it is attached, can be removed from under the car by the removal of only three nuts.

This truck is equipped with Peckham's interchangeable elastic motor wheels and fibrous steel motor axles, which were described in our issue of June 8, 1889. The advantages of these elastic wheels are that they relieve the motors from shocks and crystallization, and prevent noise. The interchangeable webs can be renewed at any car stable by any ordinary workman, without removing motors from axles, and the fibrous steel axles are stronger and more durable than any other.

These trucks are manufactured solely by the Peckham Street Car and Axle Co. of this city.

Plans for the New Hickenlooper Station at Cincinnati, O.

Some months since Gen. Andrew Hickenlooper, President of the Cincinnati Gas Light and Coke Company, foreseeing that the time had arrived when the gas company must once for all settle the question of adding an electric light and power station to its present plant, signed a roving commission, directing Mr. Geo. F. Card, of arc motor fame, to visit such cities as he desired, or deemed necessary, to secure all the data required in preparing plans and specifications for the erection and equipment of an electric plant that should be a model station, complete in every detail, and containing every modern labor-saving device requisite for the simplifying of perfect service to consumers, and that would prove economical under the conditions which will govern the operation of this station.

With these points in view, Mr. Card visited many local lighting stations in various cities, and also several of the parent factories, being cordially welcomed and afforded every opportunity for obtaining all the information desired. The experience was a valuable one, enabling Mr. Card to get at the inside facts of electric lighting from every standpoint; facts acquired often after a year or two of expensive experiment.

On inspecting the various stations Mr. Card was forcibly impressed with the general absence of all anticipation or preparation for the extensive growth of the business that always follows the installation of the arc light in a city. Thus many stations were being operated under conditions that did not permit of perfect service at a minimum cost of maintenance.

Mr. Card also noticed that the internal arrangements of no two stations were exactly alike, and that nearly every superintendent had made some slight modiflcation in the apparatus that appeared to simplify the work of the station or to reduce the running expenses.

With the experience thus gained, Mr. Card aided General Hickenlooper in preparing the plans and specifications of the station, transverse and longitudinal sections of which are shown in the accompanying illustrations, and which represent one-half of the entire plant, plans having been laid for the erection of a second building directly opposite, that shall be an exact duplicate of the one now in course of erection, except as regards such slight changes as experience shall dictate.

The station will be located opposite the gas works at the corner of Rose and Front streets. The walls of stone and brick will be of unusual thickness, and the various floors supported and separated by heavy iron beams and fireproof tiling. The floor of the boiler room is to be laid with dressed slabs of stone three inches thick and joined with cement. The same high grade of work will continue throughout the building, making it, when completed, a most substantial structure, perfectly adapted for the work designed.

The offices and store room will be on the first or ground floor, and only such supplies as can be quickly moved will be stored here. The second floor, placed ten feet above the first, will contain six horizontal tubular boilers placed on Jarvis settings, that will permit of the use of the lowest grade of fuel, the refuse coke breeze that is now thrown away.

The object of placing the boilers ten feet above the ground is to prevent all possibility of the furnaces ever being affected by high water in the Ohio River, and for that reason nothing but what is quickly removable will be allowed on the ground floor, though that is now far above the high water mark.

On the same floor with the boilers, but separated by a substantial fire-wall, will be placed the two 24 × 48 inch Corliss engines of 300 h. p. each, furnished by Lane & Bodley, of Cincinnati, and designed to carry a constant load. In addition, there will be two high-speed engines of 150 h. p. each, of some make not yet decided on, to carry the varying load during certain hours of the day.

The dynamo room will be located over the engine room and contain an extensive system of shafting. There will be thirty 35-light arc dynamos placed in this room, the system to be adopted not having been fully decided on; but should a system now being inspected prove to contain the merits its makers guarantee, it will be accepted, and ultimately 60 machines will be purchased. A high tension system will be adopted. An incandescent system will not be installed at the outset, but will probably be fully considered later on.

In addition to arc lighting, an extensive and thorough electric motor service will be afforded for all users of small power located at any point within the city limits, and every encouragement given to increase the number, as a prominent part of the business from the start will be the furnishing of current for this purpose. Constant current motors will be used for service up to 3 h. p. Above that size, motors wound for a 500-volt constant potential current will be used. While the constant current motor to be employed has not been selected, it is known that it will be one of two machines that have given excellent results under a year's test while being operated for ten hours a day by young boys and girls in the regular work of a factory without accident or loss of time or expense for repair.

A system of measurements by ampère hours will probably govern the charges, making the consumer pay only for the number of hours of service rendered. Mr. Card's experience in the motor line will enable him to settle these points satisfactorily.

The question of what insulated wire to use is yet to be settled, and depends largely on the results of tests now being made by Mr. Card with samples of overhead wires. As the total amount of wire required will probably exceed two hundred miles, great care will be exercised in selecting it. Again, it is undecided whether a pole line or a conduit system will be used. General Hickenlooper prefers to put in the latter at once, deeming it the most economical in the long run, as the city authorities will certainly order all the wires underground before long. The one important factor entering into the underground question is that many streets have been recently paved with granite or asphalt, which the contractors are under bonds to keep intact and in order for some two years to come, and public opinion is decidedly adverse to allowing the roadways to be disturbed for any reason. But there are certain alleys and side streets, not recently paved, that will permit of easy approaches to the heart of the city, and along these thoroughfares poles or conduit trunk lines may be placed. Of the latter, some system of iron pipes laid in cement will probably be adopted. The cable to be

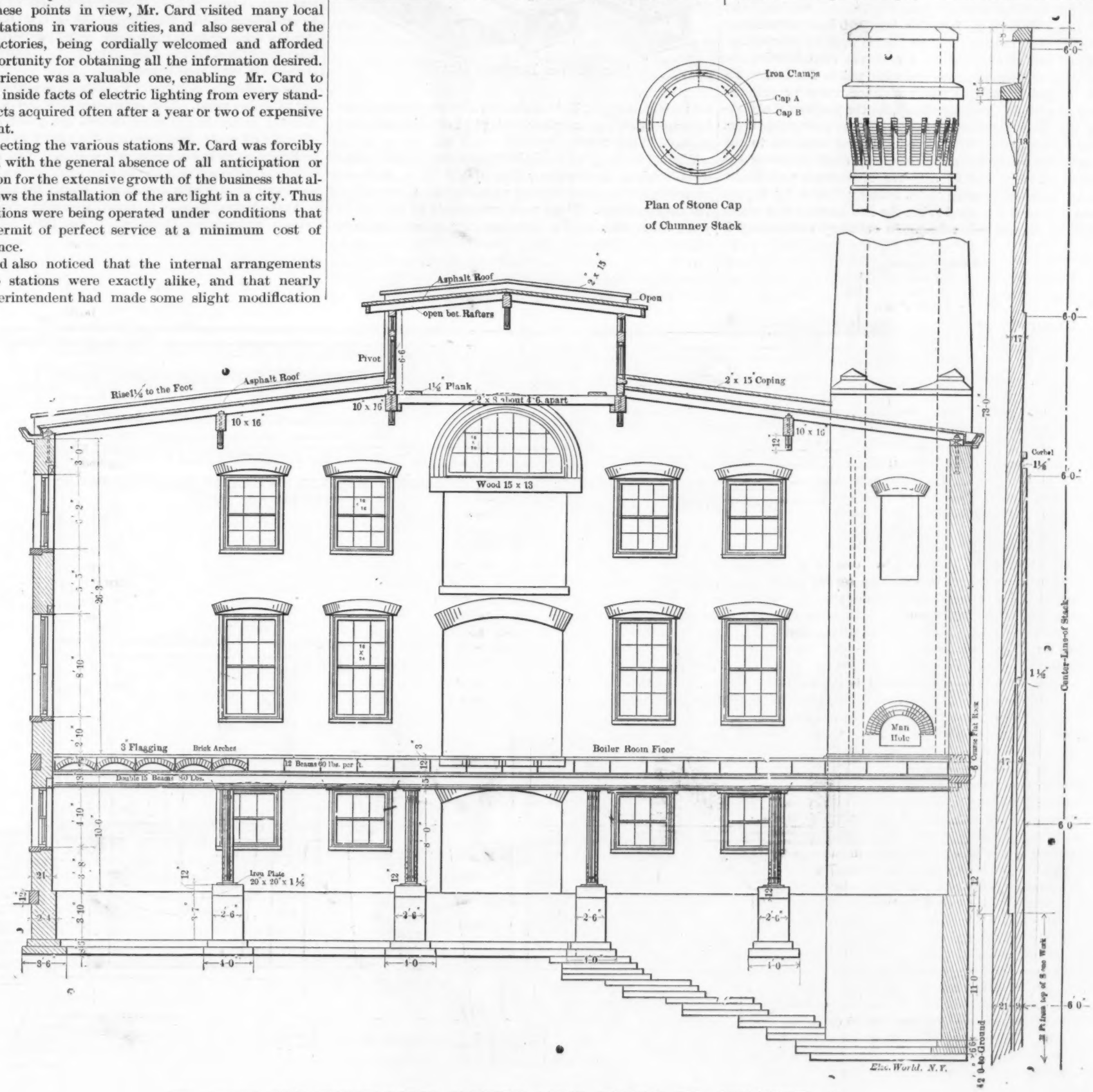


FIG. 1.—THE NEW HICKENLOOPER ELECTRIC LIGHT STATION FOR CINCINNATI, O.

drawn in the conduits will probably be one of two that have proved admirably adapted for subway service.

Owing to the thorough manner in which every detail of the work will be carried out, and the stability and ultimate magnitude of the enterprise, it is not expected that service will be furnished until after Jan. 1, 1890.

The successful termination of the great enterprises undertaken by General Hickenlooper will warrant our readers in looking forward with interest to the completion of this proposed model electric station.

The Burton Electric Heater.

We illustrate on this page the Burton electric heater which has been so much talked about, and is now being introduced by the Burton Electric Company, of Richmond, Va., for railroad heating, house warming, cooking, etc. Dr. Leigh Burton, the inventor, has just been awarded a prize by the Franklin Institute for his work in this field.

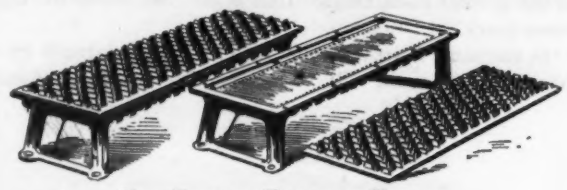
Each coil is enclosed in a cast-iron case, forming the radiating surface, and provided with points for increasing the surface, as shown. The resistance wires or coils are covered with dry, powdered clay, for the purpose of absorbing the heat from the wires, and thus preventing them from burning out. The electric current supplied to the heaters has a potential of 80 volts, and each heater is expected to use about 2½ ampères of current, each heater having a resistance of 35 ohms, it being found by experiment that such a current raises the temperature of a heater about 200 degrees Fahrenheit. In ordinary car-heating it is proposed to place the heaters under the seats, alternately, on either side, fourteen heaters in all, calling for an expenditure of 3½ electrical horse power, the heaters being connected in "multiple arc." It is proposed to generate the current for these heaters by dynamos driven from the car-axles, a surplus of current being produced and stored for use when the car is disconnected from a train, or employed to illuminate the cars with incandescent lamps. To heat a car standing in the yard, it is proposed to establish dynamos at the stations where cars are stored.

These heaters, once constructed, are expected to be permanent fixtures, requiring no further attention. The moderate rise of temperature produced precludes all danger of fire, and it is impossible for the resistance wires to be burned, unless the surrounding clay is raised to the burning temperature of the wire. The management of the heaters is equally simple. If sufficient radiating surface is provided for the coldest weather, and it is proposed to put a heater under every car-seat, in exceptional cases, it will only be necessary to cut out one or more heaters from time to time, according to changes in the weather.

Practical Experience with the Storage Battery.

BY CH. S. PATTERSON.

Having read a number of valuable articles on the storage battery in The Electrical World, and having myself had charge of a storage battery for over two years at the country residence of Mr. E. H. Johnson, at Greenwich, Conn., I thought that my experience might be of interest to others engaged in this work.



The Burton Electric Heater.

When first installed the battery consisted of 120 cells of the Electrical Accumulator Company's 15 A type, connected in two series of 60 cells each, having a capacity of 700 ampère hours. These were guaranteed to last for two years when discharged at the maximum rate of 70 ampères. The battery has been in daily use for over two years, being now reduced by four cells, and during that time there have been added to it four new cells complete and eight new positive cells.

From the first charging of this battery on June 28, 1887, until the present, it has been in constant daily use feeding Edison 16 c. p. lamps, at 101, 102 and 103 volts, at two lamps per ampère, and will to-day carry 130 lamps three or four hours without any perceptible diminution of electromotive force.

The battery has on a number of occasions carried as high as 180 lamps, which would call for 90 ampères, although it is only designed to deliver 70. Buckling and scaling of the plates has therefore resulted, which I attribute to overdischarging, as stated above. Again, on various occasions the battery has been run down completely, due to unavoidable causes. Among these was the scarcity of water, caused by freezing, and as the water is pumped by means of an electric motor, no steam could be gotten up to run the engine.

When new, the battery was charged once in three days. Last summer it was charged every other day, while now it requires to be charged daily, as the battery is getting old; but it is, nevertheless, in good working order.

My two years' experience has brought out prominently several things which are still lacking to the complete success of the installation.

Thus an instrument which will show at a glance how many ampère hours have been taken out of the battery, and how many are required to completely charge it, so as to avoid overcharging, would be of great value. Another difficulty is to keep the acid in the cells at the same density, as it has a natural tendency to become stronger at the bottom than at the top, thus ruining the bottom of the plates. In order to meet this difficulty I have had to remove one-third of the acid from the bottom of the cell with a rubber hose and turn it back. This manner of working has kept the cells in very good condition.

These cells are set three-high, one over the other, on shelving 25 inches apart. This arrangement is not to be commended, as my hands have caused me great pain when cleaning off scale from between the plates, as there is not sufficient space to keep clear of the acid. Were I fitting up a battery I should raise the shelves to 30 inches apart and so obtain greater convenience in cleaning the plates.

As the battery stands, however, I would not like to part with it, as I would perhaps have to run many hours not required now; for we use the electric light solely, even to light the carriages.

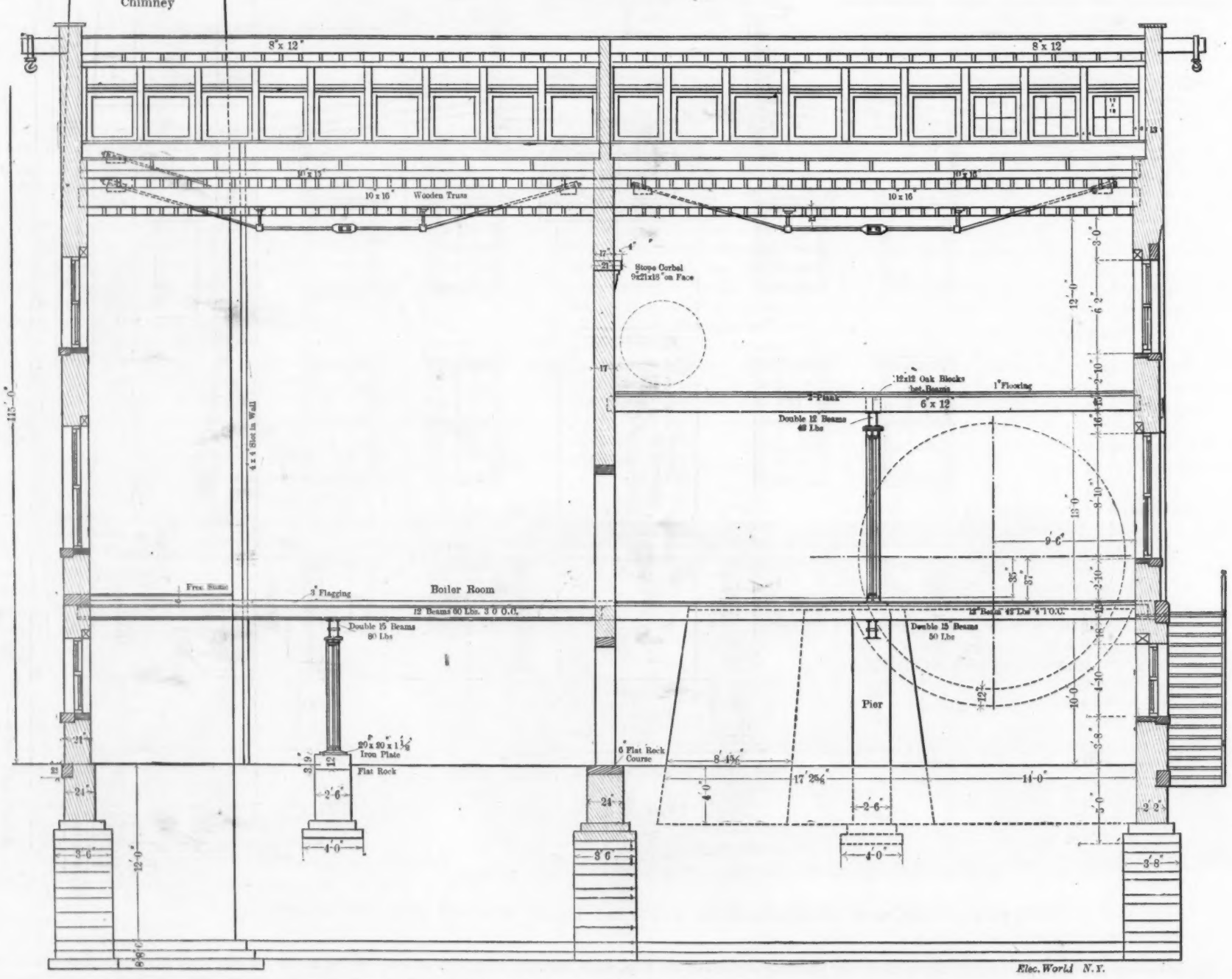


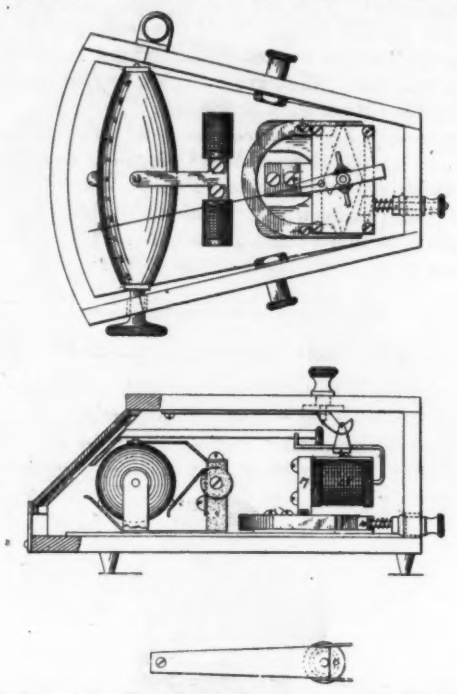
FIG. 2.—THE NEW HICKENLOOPER ELECTRIC LIGHT STATION FOR CINCINNATI, O.

Letter Postage on Phonographs.—The Post Office authorities were somewhat staggered when called upon to say what postage should be paid on the cylinders used in the phonograph and the graphophone. The question was referred to the Assistant Attorney-General, and he has decided that, being personal communications, letter rate postage must be paid on the cylinders.

Cure for Blight.—Henry Roby, of Burlington, Vt., has been conducting an interesting experiment in an effort to discover the cause of blight of pear and apple trees. He was impressed by the fact that trees had often shown blight suddenly without any apparent cause, and it occurred to him that possibly the trees were affected by electricity during showers. He took a large copper wire and bent it so that it would pass over the trees, the end being pressed into the ground as an arrester. The trees thus protected during the present season are in perfect condition.

The John A. Barrett Measuring Instruments.

In the construction of electrical measuring instruments, or galvanometers, it has been general to employ only one scale, and if alterations in the readings of the same are made by employing shunts or other devices, that reading has to be multiplied by some constant, thus requiring some skill and acquaintance with the instrument. In the new instruments devised by Mr. John A. Barrett individual scales are used, one only of which can be seen at one time, and each



FIGS. 1, 2 AND 3.—THE BARRETT MEASURING INSTRUMENT.

of which reads direct, corresponding with the altered reading of the instrument, thus enabling any tyro to obtain correct readings.

Figs. 1 and 2 show the construction and manner of connection of the instrument, the former being a plan view with the cover removed, the latter a longitudinal elevation, one side being removed.

The working parts are contained in an outer case, furnished with leveling screws, to which is attached the base plate seen in Fig. 2. On this plate is another of brass, which is pivoted in exact coincidence with the axis of the needle, and capable of rotary adjustment by means of an adjusting nut. Upon the swivel-plate is rigidly fixed the directing magnet. As in the particular instrument shown in the cut, it is only desirable to have a small amount of magnetism, as the directive force, a U-shaped armature is arranged on the swivel plate, in proximity to the ends of the directing magnet, tending to produce a magnetic circuit for the lines of force of the magnet. This armature is adjustable, being fitted with slots and clamping screws, as seen in Fig. 1. This construction provides for calibration of the instrument. The galvanometer coil is wound on a spool, which is supported from the base plate by a standard, secured to the same, the swivel plate being cut away to prevent it striking against the standard when in motion. On the top of the coil is fastened a metallic plate, in order to give the greatest length for the needle bearing, and enabling a very deep bearing cup to be used, and still facilitate the removal of the needle, by taking out the screws, which hold this plate in position, and drawing it backwardly with the upper needle, to which the lower needle is attached by means of an extension, making the system in this case astatic. The upper needle is attached to the strip of metal which carries the bearing cup, and has two wings bent upwardly and outwardly to form a lifting point for the needle lifter, which consists of a spring blade, attached by one end to the under side of the case, having at its free end hook-shaped lugs, and passing through the cover of the case a thumb screw, provided with a washer on the under side of the cover, which rotates with the screw, the free end of the blade being threaded to receive it. The hooks are passed under the wings of the needle, and when not in use the position is as in Fig. 2, where the thumb screw has been turned so as to draw up the spring blade, lifting the needle free from its bearings by means of the hooks. When the instrument is to be used the screw is rotated, forcing the blade downward and lowering the needle on to its bearing.

The index is of aluminium, projecting some distance from the coil, and turning downwardly over the scale. The front of the case is closed by a curved glass cover, which is ground at all points except the narrow slit directly in front of the scale line on the rotary scale barrel, which is formed of hard wood or other similar material and covered with a shell of white celluloid, having the three scales engraved at equi-distant points of the circumference. The barrel has a curvature corresponding with the centre of oscillation of the needle, and is supported in journals which rise from the bed plate; and at one end a thumb piece projects, enabling it to be turned to either of the scales and their respective connections. At the centre of the scale barrel are three contacts, the two shown on the right of the barrel in the figure being directly connected together through the barrel by a wire. A contact spring is fixed directly to the bed plate, projecting outwardly in front of the barrel, and at points 120 degrees apart bear two other separate springs fixed to a standard of insulating material. Two shunt coils are attached to these springs, respectively, one-ninth and one-ninety-ninth the resistance of the fixed coil, thus making the scale readings units, tens, hundreds. The line of the scales on the barrel is half way between the contact springs, one of which is arranged as a stop, being bent or notched at a point over the vertical centre of the barrel, to determine when all the springs are in contact with the respective screw heads.

The connections are as follows: The lower terminal, which we will call positive, in Fig. 1 is directly connected to one end of the galvanometer coil, the other end connecting with the metallic bracket supporting the coil, or the base plate, and from this to the other or negative terminal. From the positive terminal is connected the one-ninth shunt to the middle insulated contact spring, Fig. 2, and from the same terminal the one-ninety-ninth shunt connects with the upper contact spring. When the scale barrel is in the position shown in the figure, the two shunt coils are not in the working circuit, the reading being due to the galvanometer coil alone. If now it be turned, right-handedly, though 120 degrees, the first shunt coil circuit is established through the contact springs and internal connection to the base plate. This, of course, gives a smaller deflection on the scale, for the galvanometer coil is shunted by one of much lower resistance, and therefore the corresponding scale is used, which has come into position by the rotation of the barrel. Similarly on rotating once more in the same direction through 120 degrees, the second shunt circuit will be closed instead of the first, and its respective scale will have come into position.

It is obvious from the construction that but one scale can be seen at a time, and that in the action of presenting the same to view the right connections are made, making it impossible for the user to go wrong in taking readings. It is also very desirable on the part of such persons as physicians, who in their practice need an instrument in the form of a milleampèremeter, to be able to read directly and over large variations, the volume of current flowing in the circuit, which at that time they may be using.

"Electron:" A Volume of Poems.

To the Editors of The Electrical World:

I picked up recently on the Nassau street bookstalls a little, thin volume of poetry by W. C. Richards. It is entitled "Electron: Franklin, Field, Morse." It was published by the Appletons in 1858. The unpretending book contains some verses of not at all a low degree of merit, and I would be glad to learn a few facts as to their author. Any reader of your journal who can give information about Mr. Richards will greatly oblige me. BOOKWORM.

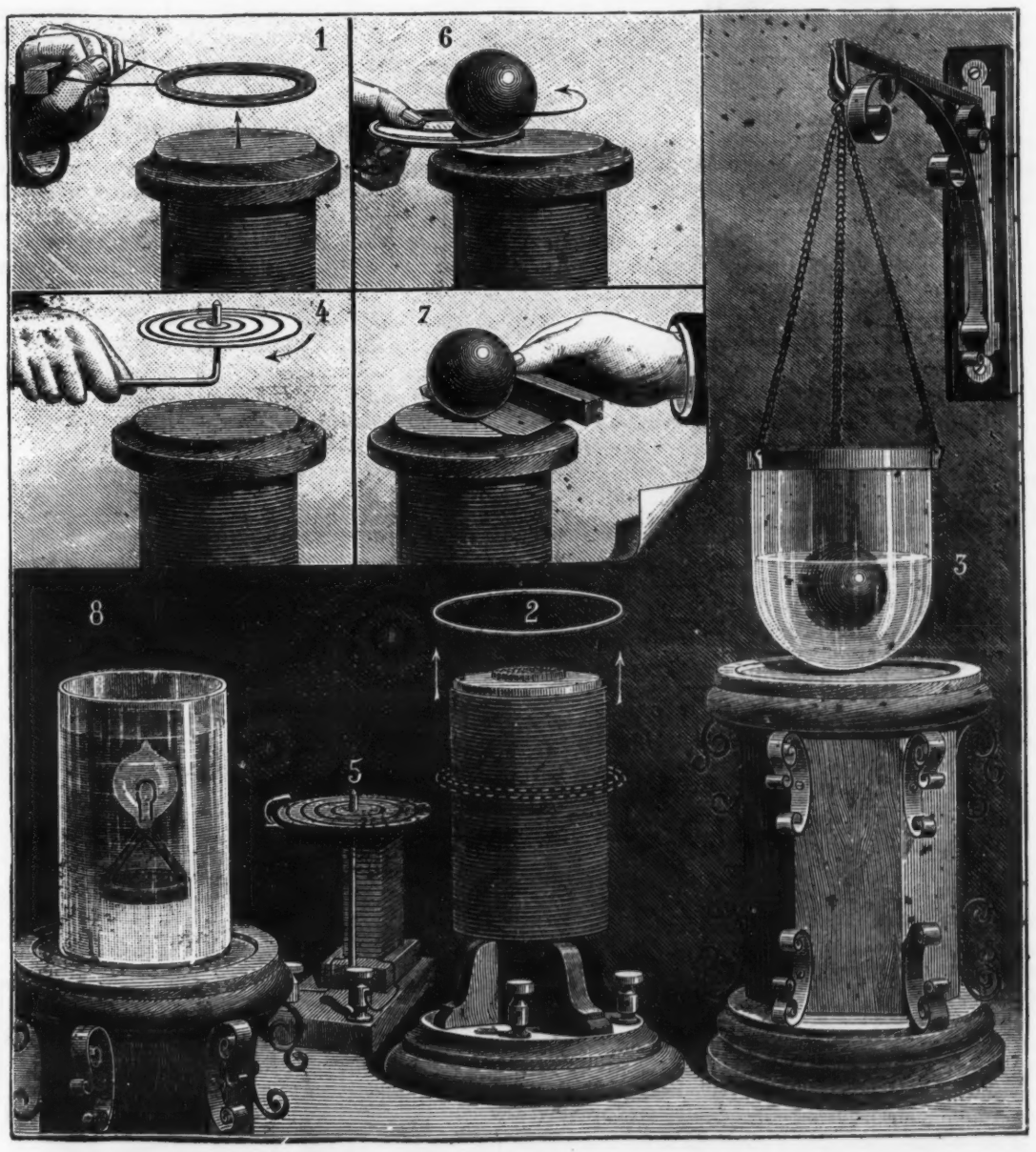
Elihu Thomson's Induction Experiments at the Paris Exposition.

The action of currents upon other currents was discovered by Ampère in 1820, a short time after the fundamental experiment of 'Oerstedt. The famous French philosopher has summed up all the principles in an approved law, which bears his name and which enables one to foretell the nature of the action, and the importance of that effect for two currents of whatever form, and also the effect of a current upon itself. Ampère, however, for some reason, did not give attention to one of the most interesting cases, that of the action of two currents in which the second is induced by the first. Previous to the time of his researches the existence of induction was not understood. Even after the discovery by Faraday in 1830, the question was allowed to remain entirely uninvestigated, and the particular effects were studied for the first time, in 1884, by Prof. Elihu Thomson, who called attention to them before the American Institute of Electrical Engineers.* Since that time he has studied them, developed them and succeeded, by means of alternating current machines, which are so largely used to-day, in performing a number of the most interesting experiments, which excite the admiration of experts and the astonishment of the numerous visitors who resort to the gallery of Liberal Arts at the International Exposition at Paris. The illustration on this page showing the experiments is taken from *La Nature*, in which M. Hospitalier says:

Let us examine in the first place the general principle upon which these experiments are based. When a core of iron is surrounded by a coil, traversed by an alternating current, it becomes magnetized periodically, first with one polarity and then with the other. This produces a flow of magnetic force which, starting from zero, increases, reaches a maximum, decreases, falls to nothing, changes its sign, and passes again through the same phases, but in an opposite direction.

With a suitable alternating current machine these alternate forces change their sign very rapidly, as often as two or three hundred times per second.

If we now place above the iron core a copper ring in a plane parallel to the lines of magnetic force (Fig. 1), the variable flow traverses this ring, inducing intensely strong currents, and these currents develop, so that if we hold the ring in place for some minutes the effect is to raise the temperature of the ring until it cannot be held by the hand. Lenz' law tells us that the induced currents will be of such a sign at any instant that they oppose the variations of the force produced by the primary coil or its inductor. Reduced to this simple phenomenon, the induced current will lag behind the inducing one a quarter of a period, and with



ELIHU THOMSON'S INDUCTION EXPERIMENTS AT THE PARIS EXPOSITION.

* Trans. Am. Inst. Elec. Engrs., Vol. IV., p. 100.

these conditions the sum of the attractions will be exactly equal to the sum of the repulsions; there will be no attractive or repulsive action between the two circuits on account of this uniformity. In fact, is it not thus that the current induced in the secondary opposes itself as soon as it is set up, by reason of the phenomenon known as self-induction? The resulting induced current is retarded or delayed a certain fraction of a period, and uniformity no longer exists. The sum of the attractions is then less than the sum of the repulsions; the repulsion predominating is sufficient to hold the ring suspended in space against the force of gravity. This repulsion is so strong that it is impossible to lay the ring or disc of copper on the magnet core, or rather on the case in which the core is concealed, and leave it by itself. It is really marvellous to see flying off at a tangent, all these objects placed on the table, which persistently refuse to remain there when left to themselves. Fig. 2 shows this experiment in a different form; on slipping a ring of copper over the magnetic core, excited by an alternating current, nearly as far as the middle point of its vertical length, this ring, if left to itself, leaps up vertically and raises itself as far as 40 centimeters above the magnet core. These experiments deal only with electro-dynamic repulsions; we can complicate the phenomena and produce very peculiar rotations by creating an unsymmetrical field. To effect this, we place upon the magnet core a half disc of copper, which covers exactly half of it. The induced currents in this disc act as perfect magnetic screens, almost completely preventing all flow of lines of force in the region above it. If we place near the magnet core, in the region

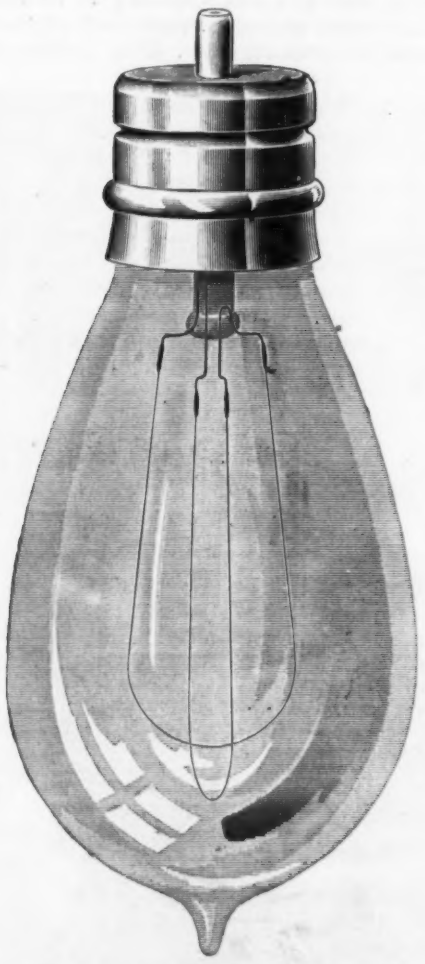


Fig. 1.—New Sawyer-Man Lamp.

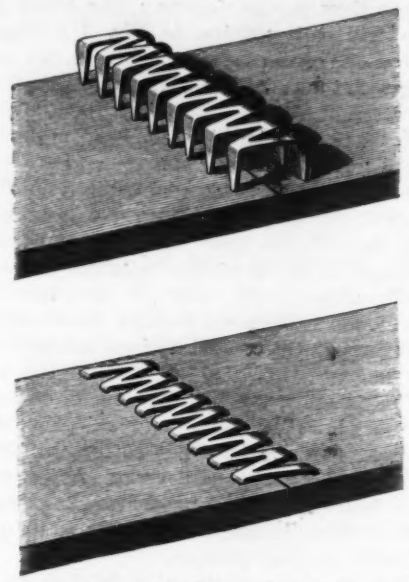
where the periodic magnetic field has been partially suppressed, a copper disc, mounted on a pivot, this disc is repulsed in the region where the flow is strongest. It dips and revolves rapidly around its vertical axis.

The same phenomenon of rotation is also produced by an inductive apparatus having a much smaller core placed under one half of the disc, Fig. 5, care being taken to so place a screen that one of the sides is placed radially to produce an unsymmetrical field. The direction of rotation is toward the screen. We may also obtain rotations and repulsions by means of a hollow copper ball placed inside a glass vessel filled with a certain quantity of water, Fig. 3. The ball is repelled, and at the same time exhibits a movement of rapid rotation, which is quite inexplicable to those who are not conversant with the phenomena of induction that cause it.

The same copper ball placed on the pedestal, the half-disc screen being, of course, concealed in the cover, performs on this platform various movements, rolling, stopping, changing its position, etc., the differences depending on the relative positions of the screen, of the core, of the ball and of the plane on which it moves, Fig. 6. We can also make the ball revolve in one place and upon its own axis by placing it on a rectangle of copper forming a screen, on which is a depression or hollow of spherical form, in which the lower part of the ball rests, so placed that the repulsions are not strong enough to force it out, Fig. 7.

A last experiment—and it is no less remarkable—demonstrates the phenomena of repulsion and induction in a striking manner.

The ring in No. 1 is replaced by a small, round coil of insulated wire, the ends of which are connected to an incandescent lamp, Fig. 8. The whole is then put into a vessel filled with water placed above an induction apparatus. When the alternating current is sent through this induction apparatus, the lamp lights up, as long as it is under the influence of the electrodynamic repulsions, and tends to rise to the surface, stopping at an intermediate position, so that the repulsion and hydrostatic pressure balance the weight of the lamp and the coil. This lamp, burning under water without any connection whatever, is one of the most beautiful and striking experiments one can

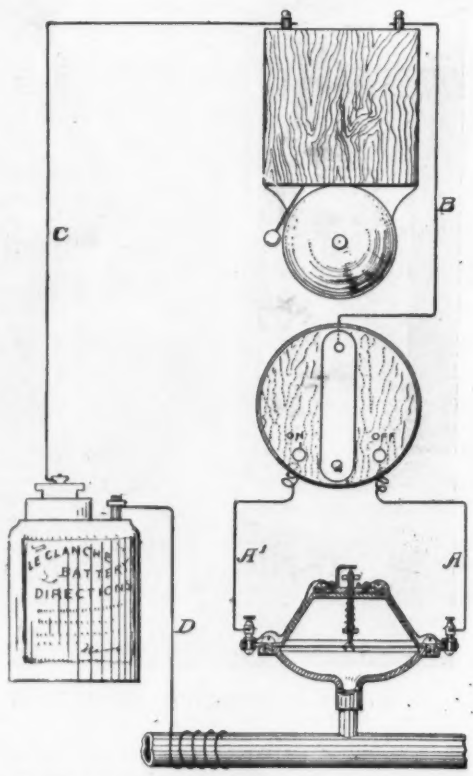


Figs. 1 and 2.—Bristol's Steel Fastening for Belts.

imagine or employ to show the induction phenomena at a distance, and the possibility of their transmission through a variety of media.

A Natural-Gas Electric Alarm.

In the towns along the gas belt it is the natural custom of householders to leave the gas burning in one stove at least during the winter nights, in expectation that the automatic cut-off commonly employed will act promptly should the pressure in the pipes be reduced, and prevent any escape of gas when the normal pressure again returns. But some of the cut-offs have not proven reliable, thereby causing several accidents and much suffering. To prevent all possibility of danger from this source an automatic electric alarm has been devised that instantly rings a bell the moment any definite change in the pressure occurs. This device, as illustrated this week, consists of a sensitive bell, a single cell of open



Bauman's Electric Natural Gas Alarm.

circuit battery, a two-point switch, and a patented brass shell arrangement containing a diaphragm, which rises or falls, according to the quantity of gas contained in the lower compartment of the sphere. In either case the electric circuit is completed, necessitating the turning of a switch to stop the ringing of a bell, which action sets the alarm for a reverse condition. Thus a man can retire at night with no fear of danger, knowing that if the pressure is reduced, ringing of the bell will awake him, and he can turn off the jets; and he need not lie awake awaiting the return of the pressure, as when it comes the bell will again awaken him, and he can light his fire in time to have the rooms warmed before the day's work begins. These patented devices are placed on the market by the Natural Gas Electric Alarm Company, of Indianapolis, Ind.

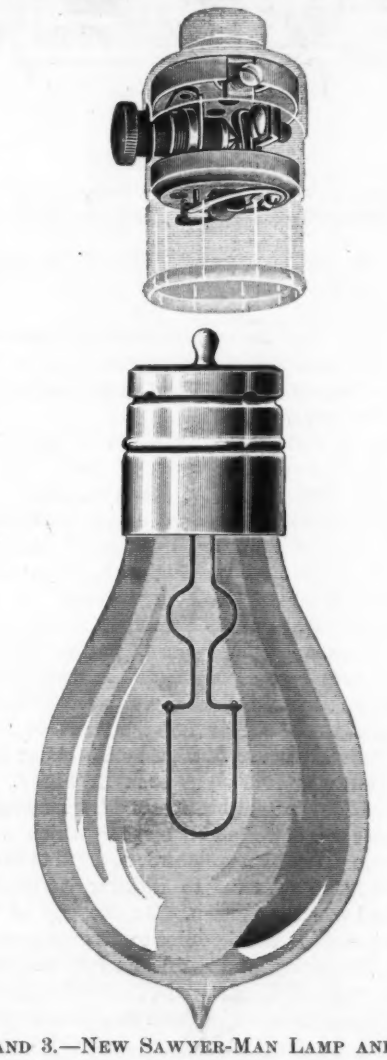
New Sawyer-Man Lamps.

In order to increase the efficiency and general applicability of their incandescent lamps, the Sawyer-Man Company, of this city, have increased the resistance so that the lamps require less current to develop the same candle-power. This increase of resistance has naturally led to the adoption of a finer carbon filament of increased length, but in order to avoid an increase in the size of the lamp the arrangement shown in the accompanying engraving, Fig. 1, has been adopted. This is a 20 c. p. lamp, intended to run at from 100 to 110 volts. Two filaments are employed placed at right angles to each other, but not as usual connected in multiple. They are in series, so that their resistance is double that of each single one.

The engraving, Fig. 2, shows the new series lamps just brought out by the Sawyer-Man Company, and designed to be placed on arc circuits. Fig. 3 shows the cut-out attached to the lamp, which contains a fusible plug in the thumb piece, so that in case of failure of the lamp from any cause it is instantly cut-out by the fusing of this plug.

Bristol's Steel Belt Fastening for Dynamo Belts.

The new type of belt fastening, which we illustrate on this page, is termed the "steel belt lacing" by reason of its resemblance in appearance and elasticity to the ordinary leather lacing. It may be quickly and easily applied, with-



Figs. 2 and 3.—New Sawyer-Man Lamp and Socket.

out employing any special tools, making a light, smooth and elastic joint, thus doing away with a large amount of the annoyance and delay incidental to the ordinary method of lacing belts with leather.

The Bristol fastening, as seen in Fig. 1, consists of a continuous zigzag strip of steel, having spurs alternating on opposite sides of a longitudinal centre line, and bent at right angles, as shown in the figure, which represents the lacing placed in position upon a belt to be joined. Fig. 2 represents the finished joint after the spurs have been driven through and clinched.

To apply it, the spurs should be driven through upon a piece of soft wood; then, laying the smooth side of the joint upon the pulley or any convenient piece of iron, the joints may be clinched.

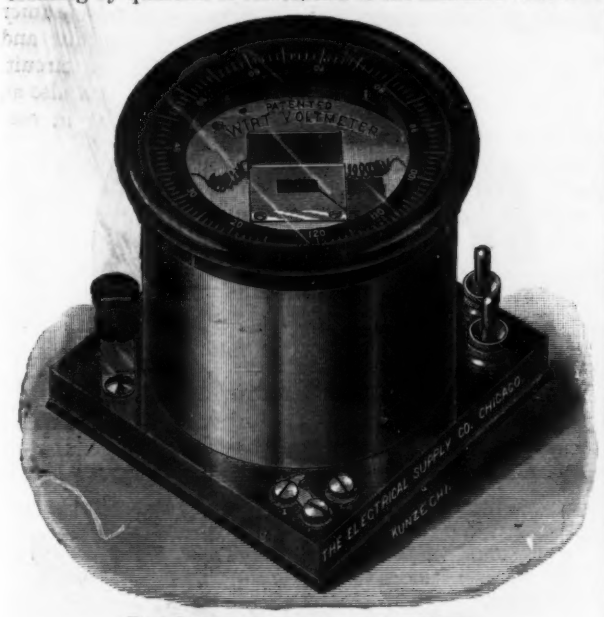
It should be noticed that the zigzag or lace-like form of the fastening renders it elastic and flexible, so that when applied it readily accommodates itself to the crown of the pulley or the twist of a cross belt; neither is there any waste material in the manufacture by reason of the form of the stamping, the first leaving the commencement of the next, and so forth. After the first zigzag is cut through, it is bent into the form in Fig. 1 by the same machine, and so on clear across the width of the fastener.

As the fastener is narrow, a slack belt can be taken up a very small amount if so desired.

The fastening was devised by Prof. W. H. Bristol, of Stevens' Institute of Technology, who, in determining the proper proportions for it, made a large number of experimental fastenings, put them into pieces of belt, and pulled them apart. He thus determined the best possible relation between the width of steel spurs and the spaces between them, and arrived at the best possible proportions.

Some of them have been in use continuously during the past five months under circumstances calculated to put them to the most severe practical test, their performance being entirely satisfactory. Had they been in use in one of the large isolated plants in this city, the belt would not have given away, as it did last week, causiug trouble and annoyance.

The Bristol Manufacturing Company, of Waterbury, Conn., are the sole manufacturers of these fastenings, which are made in lengths varying from one to three inches, increasing by quarters to correspond to the standard widths of



THE WIRT STANDARD VOLTMETER.

belting, and are put up in boxes containing 100 inches each. For belts wider than three inches, two or more lacings may be employed.

The Wirt Standard Voltmeter.

This instrument, which was the first voltmeter in the field with any claim to accuracy, is now presented in a new form, with such changes in construction, size and detail as to make it more compact, convenient and accurate than before. It is intended for all direct current work where accuracy is essential. It can be used on top of a dynamo without detriment, and has a very small temperature coefficient. It has neither permanent magnet, electro-magnet, movable coil, springs nor plugs. Mechanically it is simple, solid and well made, fit to stand any amount of shipping and handling.

The essential requisites of an electrical measuring instrument are, first, accuracy and sensitiveness; next, a wide range, simplicity and convenience; and thirdly, the ability to stand the exigencies of ordinary use. That this instrument has these and other good points, has been shown by its good work under the most exacting conditions. The principle of the old and new Wirt voltmeter is the balancing against a known standard, of the pressure to be measured. There is no better method known. The best standard yet produced is the Clark cell and to put such a combination into compact and portable form required considerable skill and expenditure of time. Two cells are put into each instrument with means for comparing them. They are the true Clark cell, but so made as to stand all the hard usuage that they may encounter. They may be sent by mail any distance, and have staying power that would surprise any one familiar with the ordinary delicate form of Clark cell. They will last an infinite time, probably several years, and are cheaply and easily replaced. The range of the instrument is from 1.5 to 250 volts. Special high reading instruments are made to order. The lower readings are made to 1-10 volt and are easily read to 1-100. Thus a single cell of primary or secondary battery can be tested with precision. The high resistance of the instrument, about 2,500 ohms, is a valuable feature.

Shunts can be furnished when desired at a small cost, by the use of which currents from one-half to 20 ampères can be measured by the potential difference method. The ability to make both volt and ampère readings with one instrument and with an accuracy scarcely to be surpassed, is something that will appeal to every electrician. The instruments are the invention of Mr. Charles Wirt and are marketed by the Electrical Supply Company, of Chicago.

Carhart's New Burglar Alarm Spring.

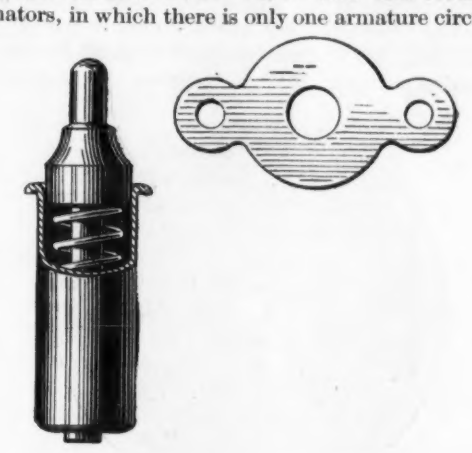
The spring shown in our illustration has been especially designed by Mr. E. M. Carhart, of Boston, to meet the demand for an efficient, simple and reliable spring for burglar alarm work. These conditions are all admirably carried out in this new form. Its extreme simplicity is shown in that there is no insulating material about it. When in the position shown in the figure, upon the plate being slipped over the rod, contact is made by the plate in the taper part of the rod, the one being positive and the other negative. In this position the bell would ring. When the door or window, as the case may be, is closed, and in its normal position, the rod is pushed in by the same, and is thus insulated by an air-space only from the plate. It is very easily and quickly fitted, three augers being required to bore the holes of exact size, and then all that is necessary is to push in the little combination into place and screw on the plate. A further advantage is, that being constructed all in one piece—the spring and the rod not being detachable—it is very compact.

The Heisler System at the Paris Exposition.

One of the American electric light exhibits at Paris well worthy of notice is that of Mr. Heisler, of St. Louis, which is situated in the Machinery Hall. Mr. Heisler was one of the first to give special attention to street lighting by incandescent lamps, says *Industries*, and although as a general rule English electricians are opposed to the employment of small lamps for out-door purposes, it cannot be denied that the expense of installing and working arc lights in the streets of small towns and villages, may in many cases be prohibitive, and then the use of glow lamps is the only alternative, if the lighting if to be done by electricity at all. It was with special reference to small towns and villages where powerful arc lights could not be afforded, that Mr. Heisler has worked out the system which bears his name, and the principal feature of which is the working in series of a large number of low voltage glow lamps. In so far the Heisler system is similar to that advocated by Mr. Bernstein, but while the latter inventor prefers to work with a continuous current, Mr. Heisler adopts an alternating current, or rather two alternating currents, for each machine contains two independent circuits, each traversed by a 5-ampère current, the lamps being rated at 30-candle power.

The reason why each machine is wound with two circuits is partly to reduce the voltage of each individual circuit, partly to obtain the advantage of overlapping circuits, so that failure in one cannot plunge the whole district into darkness, and partly to increase the output of the alternator. It may at first sight appear immaterial whether a given amount of armature wire is arranged in one circuit or in two circuits, but upon closer inspection it will be seen that with two circuits the E. M. F. generated in each must be more than half of the E. M. F. which would be generated if the whole of the wire were arranged in one circuit.

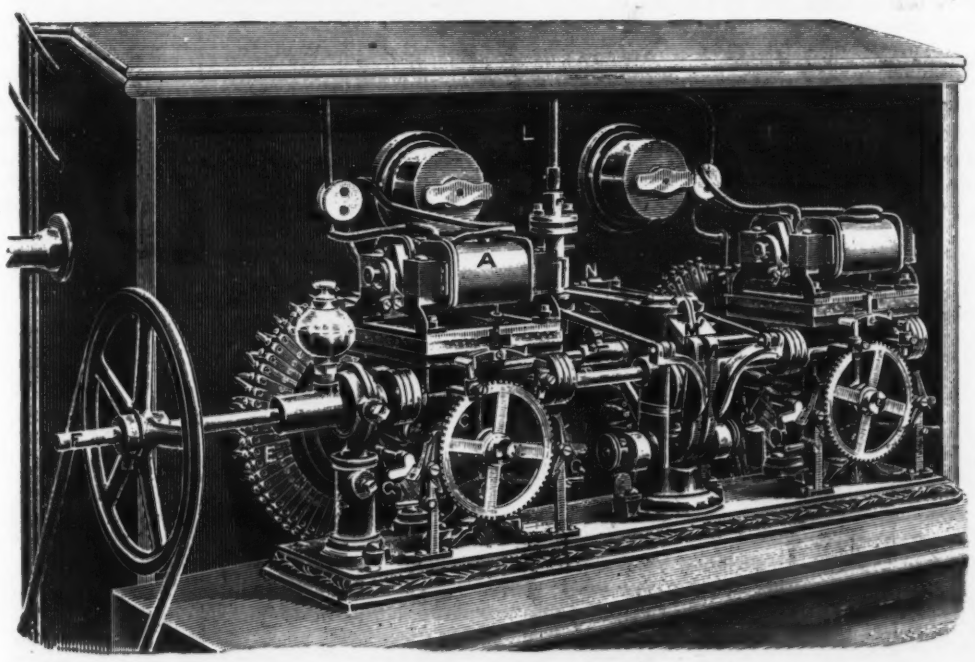
To make this point clear, let us consider first the case in which the whole available surface of the armature is covered by wire, and all the coils are joined in series. In this case there is only one position of the armature coils relatively to the field poles when the E. M. F. developed in all the active wires is additive, and this occurs when each field pole coincides with the centre of each group of active wires. In every other position there is a differential action between wires of the same coil, the E. M. F. generated in some being opposed to that in others; and with a view to avoid the loss of E. M. F. which would thus occur, most alternators, in which there is only one armature circuit, are

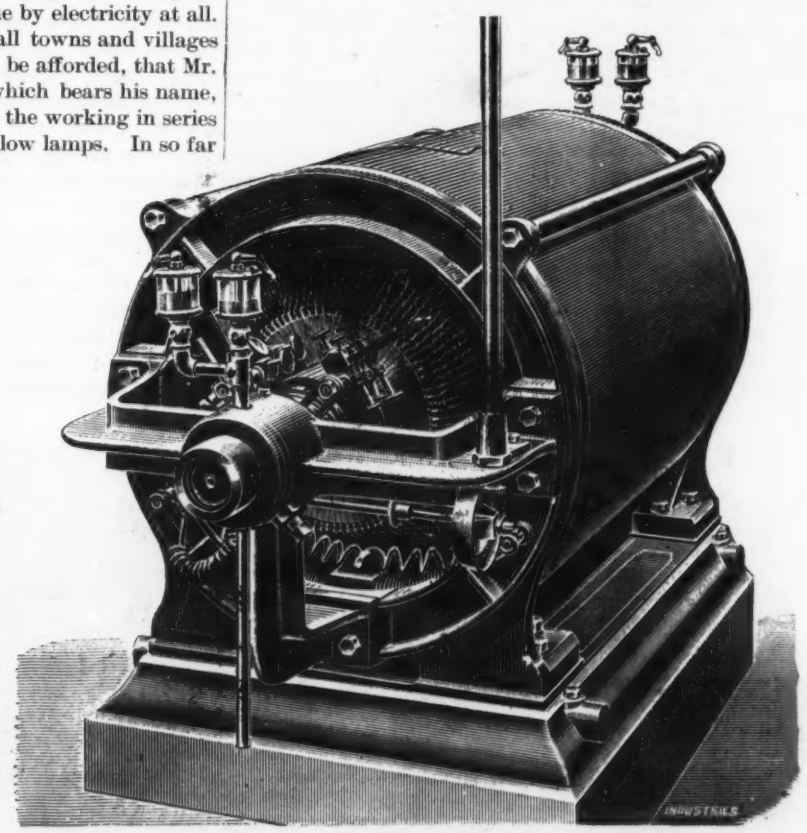


CARHART'S BURGLAR ALARM SPRING.

now built in such a way as to leave a certain distance between the groups of wires composing the coils, the best effect relatively to the amount of wires employed being obtained when only about half the armature surface is covered by the coils, and when groups of wires alternate with blank spaces of about equal width.

In the Heisler machine the blank spaces are utilized for the second armature circuit, and thus with a given weight of wire a larger output is obtained. We illustrate the Heisler machine in Fig. 2. The field magnets are of star shape, and mounted upon the spindle within a cylindrical armature, the internal surface of which is covered by the armature coils, which are arranged in two circuits. The connections between the coils are so made as to avoid large differences of potential between adjacent coils. In this machine the armature remains at rest while the field revolves, and on the same spindle which carries the star-





FIGS. 1 AND 2.—HEISLER LONG DISTANCE INCANDESCENT LIGHTING APPARATUS.

shaped field magnet is mounted an ordinary Gramme ring, which in our illustration is seen in front, and is provided with a commutator and a pair of brushes in the usual manner. This Gramme ring revolves between four fixed poles, forming the exciting dynamo, and the current from it is sent through the revolving field of the alternator. With a view to mechanically protect the armature of the alternator and the connections between its coils, the whole machine is encased in a sheet iron cylinder, as shown. The following is a list of machines, all made for two circuits of 5 ampères, and speeded at 830 revolutions per minute:

Terminal pressure in each of the two 5 ampère circuits.	Horse power required on dynamo pulley.	Weight. Cwts.
1,120	23	14
1,400	29	18
1,750	36	23
2,100	43	27
2,450	50	32
2,800	57	36
3,500	72	45

The most interesting part of the whole system is the automatic regulator, which we illustrate in Fig. 1. This ap

paratus effectively maintains the current in each circuit constant, whatever may be the number of lamps inserted. Since this is a constant current system, it is necessary to short circuit the terminals of any lamp which is to be extinguished, and if a lamp is to be lighted, the short circuit is opened, thus forcing the current to pass through the lamp. The total E. M. F. required in each circuit is therefore proportional to the number of lamps lighted, and if the machine had to supply only one circuit, the necessary variation in E. M. F. could be easily obtained by adjusting the exciting current. Now, in practice the machine supplies two circuits, and that exciting current which may suit the requirements of one circuit may not suit those of the other, hence it is necessary to introduce an additional regulating device. It is assumed that in laying out the installation the two circuits have been arranged so that the number of lamps should at all times be approximately the same in both, and this can generally be managed, especially if the circuits are overlapping. But it is not possible to insure absolute equality in the number of lamps burning at any time on the two circuits, and in the Heisler system any small difference in the E. M. F. between the two circuits is compensated by an artificial resistance placed in that circuit which at the time contains the smaller number of lamps. We have thus two methods of regulation—first, the adjustment of the exciting current, by means of which the E. M. F. in both circuits is simultaneously varied, and this means is employed as long as the variation in the number of lamps fed from both circuits takes place simultaneously. If, however, a sensible difference should exist in the loads on both circuits, then the second adjustment comes into play, and into the lightly loaded circuit is inserted a certain amount of artificial resistance. This is automatically performed by the regulator, which we represent in Fig. 1. The whole apparatus is contained in a small wooden box placed upon a stand, which contains the resistance coils, the latter being connected with multiple contact rings *E*, over each of which a contact lever slides, actuated by the mechanism we are about to describe. A spindle *F* passes horizontally through the case, and receives motion by means of a gut from the shaft of the steam engine. The shaft *F* is constantly revolving and actuates by means of eccentrics the pawls *G G* set on an opposite diameter of the toothed wheel *C*, the shaft *D* of which carries the contact of the rheostat switch *E*. The pawls are so set that one moves the wheel in one direction, that is, reduces the resistance of the rheostat, while the other moves the wheel in the opposite, that is increases the resistance of the rheostat; but if regulation is not required no movement takes place, since the pawls are prevented from touching the wheel on either side by the presence of the piece *B*, the position of which is influenced by the current in the main circuit. This current is passed through the exciting coils of an electro-magnet *A*, having a laminated core and laminated armature pivoted on a horizontal axis. In consequence of the passage of the alternating current through the electro-magnet, the armature tends to set itself in line with the poles, but is prevented from doing so by a spring coiled upon its axis. According to the tension given to this spring, the main current can be regulated. The piece *B* is connected with this armature, so that it is lowered if the current increases, and the armature consequently becomes more horizontal, while if the current decreases, and allows the spring to pull the armature further toward its vertical position, the piece *B* rises. When this has lifted, one of the pawls is allowed to touch, and imparts motion to the toothed wheel in one direction, while when the piece *B* drops the other pawl imparts motion in the opposite direction, thus altering the rheostat resistance. When the current is normal the piece *B* is in an intermediate position, and both pawls are kept off the toothed wheel. The same apparatus is repeated on the other side, while between the two is the device for effecting the regulation of the strength of field.

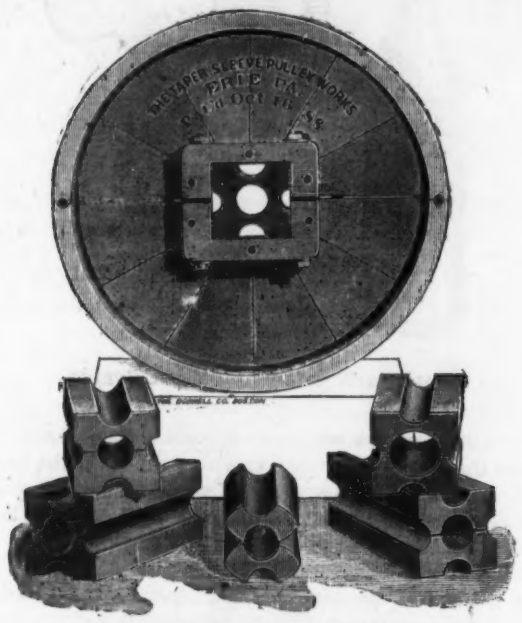


Fig. 1.—Taper Sleeve Pulley.

This is accomplished by moving the brushes of the exciting dynamos. It will be seen from our illustration, Fig. 1, that below the bracket carrying the front bearing of the armature spindle there is a small bevel gear. The vertical shaft of this gear, which passes through the bracket, is geared with the shaft *L* passing upward from the automatic regulating apparatus; while the horizontal shaft in Fig. 1 is provided with a worm, which engages with a worm wheel in the cross bar of the brush holders. By turning the shaft *L* in one or the other direction the brushes of the exciting dynamo can therefore be displaced forward or backward, and thus the E.M.F. collected on the commutator is varied, which produces a corresponding variation in the E.M.F. of the two main circuits. On the shaft *F* are fixed two cams, which impart a rocking motion to the two levers *M*, and by means of the curved pieces shown in front, to the rods *N*. These rods actuate pawls engaging with a toothed wheel fixed to the vertical spindle *L*. As long as the levers *M* are allowed to press against the cams on the shaft *F*, the pawls move backwards and forwards; but when the piece M^1 is interposed the levers *M* are held off the cams and motion ceases. This is the case when either of the two contact levers of the rheostat switches *E* occupies its zero position. The corresponding rheostat is then completely cut out, and the circuit is fed at the terminal pressure of the machine. The other circuit, which we assume to be less loaded, is fed at a lower pressure, the reduction being due to the loss of E. M. F. caused by the other rheostat. Now suppose that some of the lamps on the first circuit are extinguished, and that, consequently, the load on both circuits becomes more nearly equal. The immediate effect will be to slightly increase the current passing through the first circuit, and this will cause the regulating apparatus to come into play; in other words, a certain amount of resistance will be inserted into the first circuit, so that now both circuits contain resistances. This would, however, be a useless waste of power, which could be avoided by reducing the E. M. F. at the machine terminals.

This is actually done automatically by the regulator. As soon as the contact lever of the rheostat in the first circuit leaves its zero position, the corresponding piece M^1 drops, and allows the lever *M* to move, whereby the brushes on the exciting dynamo are shifted to a position of lower E. M. F. The current in both main circuits becomes now slightly reduced, and both regulators begin to work cutting-out resistances. As soon as either contact lever has attained zero position the piece M^1 is raised again, and further motion of the brushes ceases. Upon an increase of load in the first circuit the opposite motion is produced, the brushes being shifted into a position of greater E. M. F., and resistance is added in the second circuit. In this way the amount of resistance inserted at any time is only that required to make up for differences of load in the two circuits, and the waste of energy is reduced to a minimum.

As regards the details of lamp fitting and house wiring, these do not materially differ from those of other constant current series systems. Each lamp fitting is provided with a short-circuiting switch, and with an automatic device producing the short circuit if the lamp is withdrawn or broken. At the entrance of the mains into the premises of each consumer is also a switch by which the consumer is able to cut off the current from the house circuit, and to provide against accidental rupture of the house circuit, the box in which this switch is placed contains also an automatic device which short circuits the mains in case of such interruption in the house circuit. This apparatus consists of an electro-magnet of high resistance (200 to 300 ohms) coupled as a shunt to the house circuit, and provided with an armature, which, when attracted, releases a trigger, and allows a spring to close the main switch. Ordinarily, the excitation of this magnet is too feeble to attract the armature; but should, from a break of continuity, the potential on the terminals of this electro-magnet rise beyond a certain limit, the trigger is released, and the house circuit is automatically cut out.

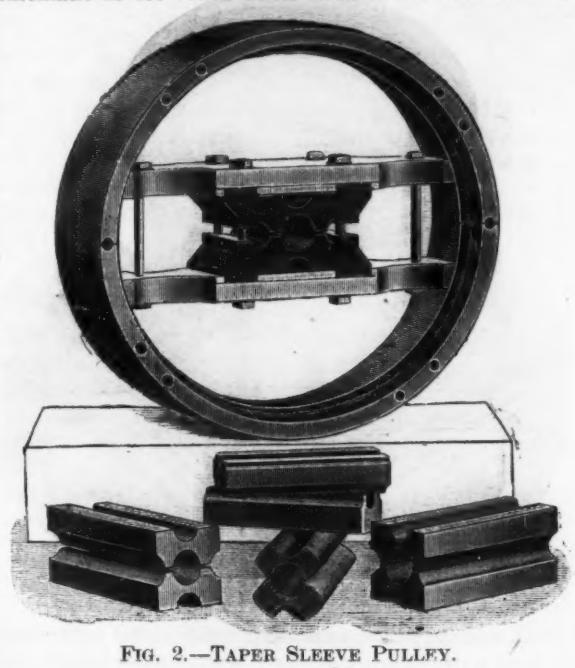


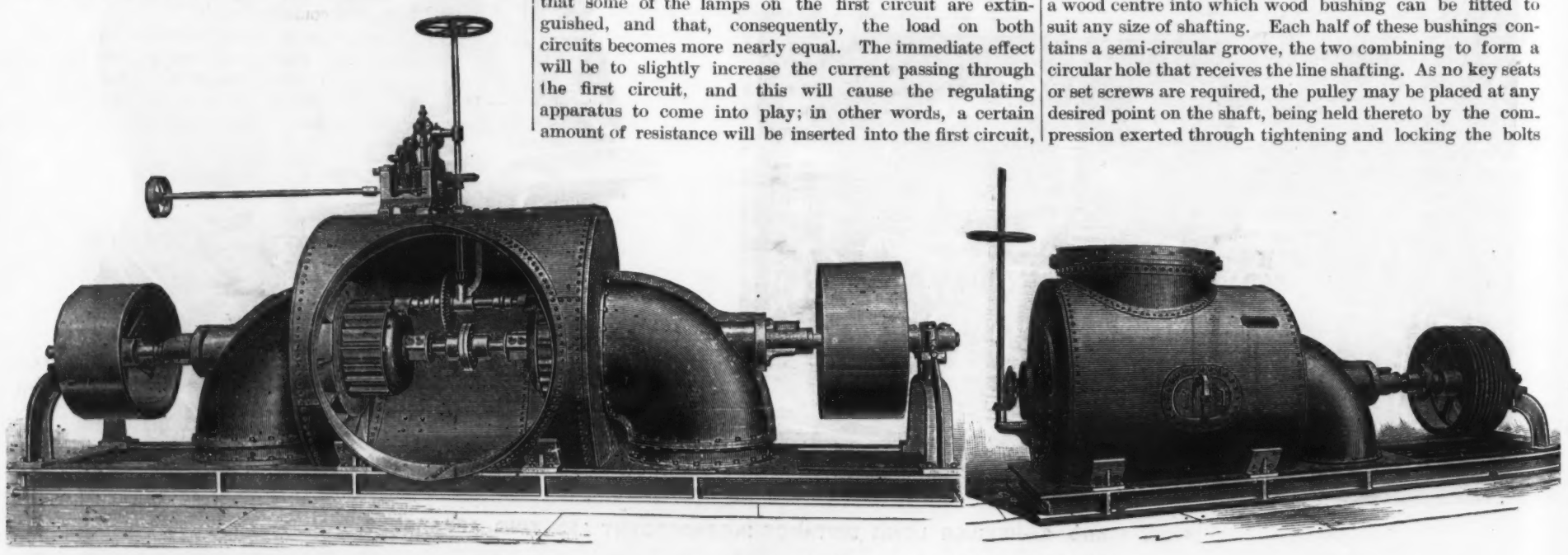
Fig. 2.—Taper Sleeve Pulley.

Pulleys for Electric Light Plants.

The Taper Sleeve Pulley Works, of Erie, Pa., have placed upon the market a set of pulleys that contain several features of interest to central station managers.

Fig. 1 represents a separable pulley with a solid web and a wood centre into which wood bushing can be fitted to suit any size of shafting. Each half of these bushings contains a semi-circular groove, the two combining to form a circular hole that receives the line shafting. As no key seats or set screws are required, the pulley may be placed at any desired point on the shaft, being held thereto by the compression exerted through tightening and locking the bolts projecting through the arms. Should occasion arise for using the same pulley on a shaft of different size, it can be utilized by simply reversing the bushings which will give a hole of different diameter, or new bushings of the correct diameter can be purchased for a trifle.

Fig. 2 represents a separable pulley with two arms, between which is the line of separation, in the centre of which the same style of bushings can be used.



FIGS. 1 AND 2.—VICTOR TURBINES USED IN ELECTRIC LIGHTING.

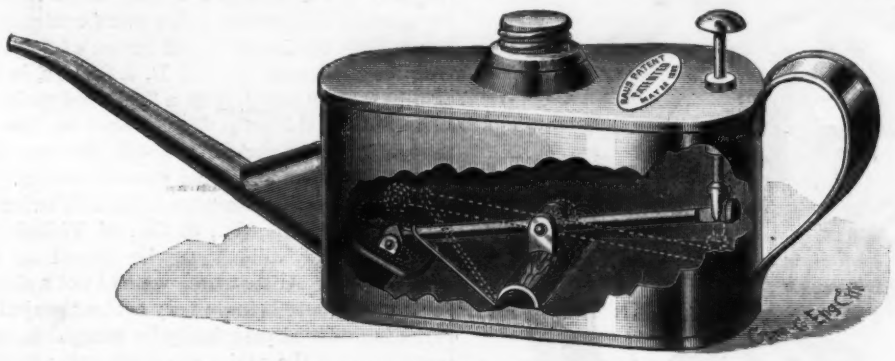
Victor Turbines in Electric Light Plants.

We illustrate on this page Victor turbines supplied by the Stillwell & Bierce Manufacturing Company, of Dayton, O., for electric lighting work. Fig. 1 represents a pair of Victor turbines water wheels, 20 inches in diameter, with cast iron bed, driving pulleys and governor complete. They were furnished to the San Bernardino Electric Light and Power Company, of San Bernardino, Cal., and the details of construction are so plainly shown in the cut that no description is necessary. Fig. 2 repre-

sents a single horizontal "Victor turbine" water wheel, with grooved pulley for rope transmission, placed under 90 feet head in the mill of J. G. Davis & Co., Rochester, N. Y. The situation is a difficult one, and required engineering ability of a high order to satisfactorily meet the demands. Messrs. Davis & Co. write that the wheel is giving them the greatest satisfaction, and with a ⅛ gate they are making 500 barrels of flour daily. The throwing in or out of their 50-light dynamo and freight elevator with friction clutch is scarcely perceptible in the motion indicator.

The Rau Patent Oil Can.

How to secure perfect lubrication with the least expenditure of oil and time is an important consideration with all engineers, whether operating stationary engines,



THE RAU PATENT OIL CAN.

locomotives, or electric light machinery, and many devices have been produced, each offering some improvement in this direction. The latest design is illustrated herewith, and it is so simple in its mechanism that any explanation appears unnecessary. Ordinarily a can has to be inverted when oiling a machine. By taking advantage of the ordinary pressure of the air, which equals fifteen pounds per square inch, the necessary oiling can be done with the Rau can by pressing the button with the thumb. This releases the valve covering the orifice of the tube, and the oil flows into and out of the tube; but the moment the pressure on the button is released and the value closes over the orifice, the oil then in the tube remains, being held there by the pressure of the external atmosphere, and it is ready for the next operation. Each part is made with the utmost precision by skilled labor to fit its respective place, in order that perfect action and a free flow of oil may at all times be secured. So thoroughly has the work been done, the manufacturers claim, that engineers have done all the required oiling in one-third the time required with the ordinary oil can, and the saving in oil each week has amounted to more than the cost of the can. This can is placed on the market by the Rau Patent Oil Can Company, Chicago.

The Rudd Automatic Ground Alarm.

Among the exhibits at the National Electric Light Convention at Niagara Falls was the Rudd automatic ground alarm, an outline sketch of which we present to-day. This alarm is intended primarily for arc light circuits, and its operation is caused by the inductive effect of the current. As shown in the sketch, *E* and *E'* represent condensers. From the central point between the condensers is a circuit passing through magnet *S* to the earth. *B* is a vibrating bell with a one-cell battery, so arranged as to be operated when the shutter of magnet *S* falls away. The condensers are connected to either side of dynamo *D* and its circuit *C*. The operation of the shutter of magnet *S* is produced by any sudden disturbance of insulation upon circuit *C*. While such disturbance does not exist the magnet *S* remains neutral. The bell *B* and its battery may be operated by any one of a number of magnets.

The Western Electric Company, of Chicago, made the sample shown at the convention.

The Slater Process for the Extraction of Zinc from Silver Ores.

This process is about to be demonstrated on a practical scale at Leadville, Colo. Repeated tests on the laboratory scale have shown the most promising prospects, and now a plant of practical proportions is being erected by the inventor at the Manville smelter in Colorado, for the purpose of testing the process as to its economy. The dynamo used is of 30 volts and 1,000 ampères, and was made by the the Edison Company on special order for this plant; and all of the other electrical apparatus was made under the inventor's supervision during a recent trip East for that purpose.

Great interest has been awakened throughout Colorado in this invention, as it promises to revolutionize the treatment of low grade blendous silver ores.

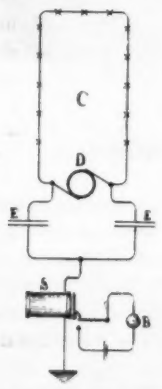
It is not beyond possibility that, in the event of success with this process, Leadville will experience a greater boom than it did in 1878–79, for there are millions of tons of the class of mineral it proposes to treat lying untouched in the mines, because of their intractability to present known methods of reduction.

Leadville capitalists were so well satisfied with the work of the process on a small scale that they have secured the right for the State of Colorado. There are many other localities, however, in which the process will be of great value.

Such ores are found in Missouri, Arkansas, the Carolinas, the Virginias, New Jersey and other eastern States, Arizona, New Mexico, Utah, Montana, Nevada, etc. The inventor has received repeated inquiries from different parts of the world on the subject, showing the almost universal occurrence of this class of ore and the need of a profitable means of reduction.

The McNamar Fire System at Toledo, O.

The value of a perfect electric service comprising watchman and fire-alarm protection was never better illustrated than by the remark of an insurance agent in Toledo, who said: "The total loss by fire in all the buildings using the McNamar system has been less than $300 in thirteen years, and to encourage its use we allow a considerable reduction in the rates." To-day some four hundred houses are cared for by this system, the respective watchmen sending their



RUDD'S AUTOMATIC GROUND ALARM.

reports half hourly, a record of each report being entered on a special blank that is afterward preserved for future reference, and a copy sent daily to each subscriber.

Mr. J. M. McNamar, the owner of the system, is also the head of the city fire-alarm department, and has succeeded in having fire-alarm boxes placed at every street intersection throughout the city. This in itself is a great factor of safety, as in the case of fire one has but to run to the first corner to send in the alarm, and the engines are thus brought directly to the nearest hydrant, thus saving the few moments most precious in controlling the progress of a fire. Including public and private boxes and telephones, there are some 1,800 points from which an instant alarm can be sent in to the central office, and from there to all the engine houses, while the requisite number of taps are struck on the two tower bells. When an alarm comes in by telephone, a single tap on a key calls a man to the telephone at every engine-house, and the mere throwing of a switch in the central office enables instant communication to be held with each and every one by means of a long-distance telephone transmitter. In the same manner instant communication is also held with the city water-works.

Mr. McNamar places little faith in the multi-call box, and uses a separate box for fire and for watchmen, though from the latter box a fire signal can be sent in by removing a pin and turning the handle to the furthest limit. Simplicity and centralization are the watchwords of the system.

A Sign made with Edison Lamps.

Among the numerous gifts recently made to the Chicago Electric Club for its new quarters is a very handsome sign built up from Edison lamps. It was presented by the Edison Lamp Company, who constructed it at their Harrison, N. J., factory. An engraving of the sign is given herewith. The dimensions of the sign are five feet by two feet. It consists of a large board covered with black velvet. Upon this board are mounted 208 small Edison lamps of 3 c. p. each. These lamps are socketed, and fit into receptacles which are screwed upon the face of the velvet. The front is covered with plate-glass, and the electrical connections are all out of sight, being concealed at the back. This wiring was also done at the Harrison factory.

The sign will be placed, we learn from Mr. W. H Meadowcroft, in the doorway leading to the club rooms. The lamps are arranged in groups of 13 in multiple arc, and 16 of these groups in series. The current will be furnished from one of the underground circuits fed by the Edison Chicago central station. The club is certainly to be congratulated upon its acquisition of this beautiful and appropriate piece of work.

A Kansan Favors Carbonic Acid Gas.

To the Editors of The Electrical World:

I have been much interested in the discussion concerning the use of electricity in capital punishment. I agree in the position taken by your paper, that it would be wrong to use this agent in such a way as to produce fear or odium in the popular mind.

I have long thought that hanging should be replaced by some more civilized method. One has been suggested to me, by reading of its frequent employment to commit suicide, and I know that its use is favored by many scientists and professional men, and I have been surprised that no mention has been made of it in all that has been written on the subject during the present discussion. It is the use of carbonic acid gas.

This method of capital punishment really has everything to commend it and no objectionable features. To prepare the death cell and the simple apparatus to generate the gas need cost the state but a few hundred dollars.

Its use would not require an expert; any one with ordinary intelligence could operate it.

There is no danger of failure to secure a fatal result.

It is as far as science can judge an absolutely painless way to death. The criminal grows sleepy, and sleeping dies; some may object that it is too easy, but the object of capital punishment is not to hurt the criminal, but to protect society by removing a dangerous member, and by deterring others from committing capital offenses.

This form of execution, though painless, would be full of dread, and terrible to the imagination of the criminal class. Think of the way in which most criminals ascend the scaffold. Often stimulated by liquor and narcotics, they are full of bravado, they loudly protest their innocence, and boast that they are not afraid to die. They defy the law to the last. There is nothing terrible in this to their class, but rather something to admire. Or they are drugged by sentimental doctors of divinity with false ideas of repentance and false hopes of salvation; and the red-handed murderer goes to the scaffold shouting his hopes of heaven and his love for Jesus. There is nothing in this to deter the criminal. But in the silence

A SIGN MADE WITH EDISON LAMPS.

of the death cell, with no crowd to see how brave he is, or to admire him as a saint, alone he meets death without the hope of doing or saying anything that his fellows can applaud.

In case of execution in this way, the law should fix, not *a day*, but *a period* within which the sentence should be executed; say within three days or a week, at the discretion of the proper officer.

There may be objections to this method, but I have never yet heard one urged. I make these suggestions to you to do with as you think best. If the method recommends itself to your judgment, your paper has sufficient influence and circulation to secure for it a consideration at the hands of the people of your State.

Especially at this time will it be easy to do this, as the public mind is already interested in the subject.

HUTCHINSON, Kan. J. B. ALLEN.

The New 100 H. P. Straight Line Engine.

A large number of Straight Line engines are in use in electric lighting and power plants, and a new form of the engine has now been introduced for this class of work. It is illustrated in perspective and horizontal section on thi page, Figs. 1 and 2.

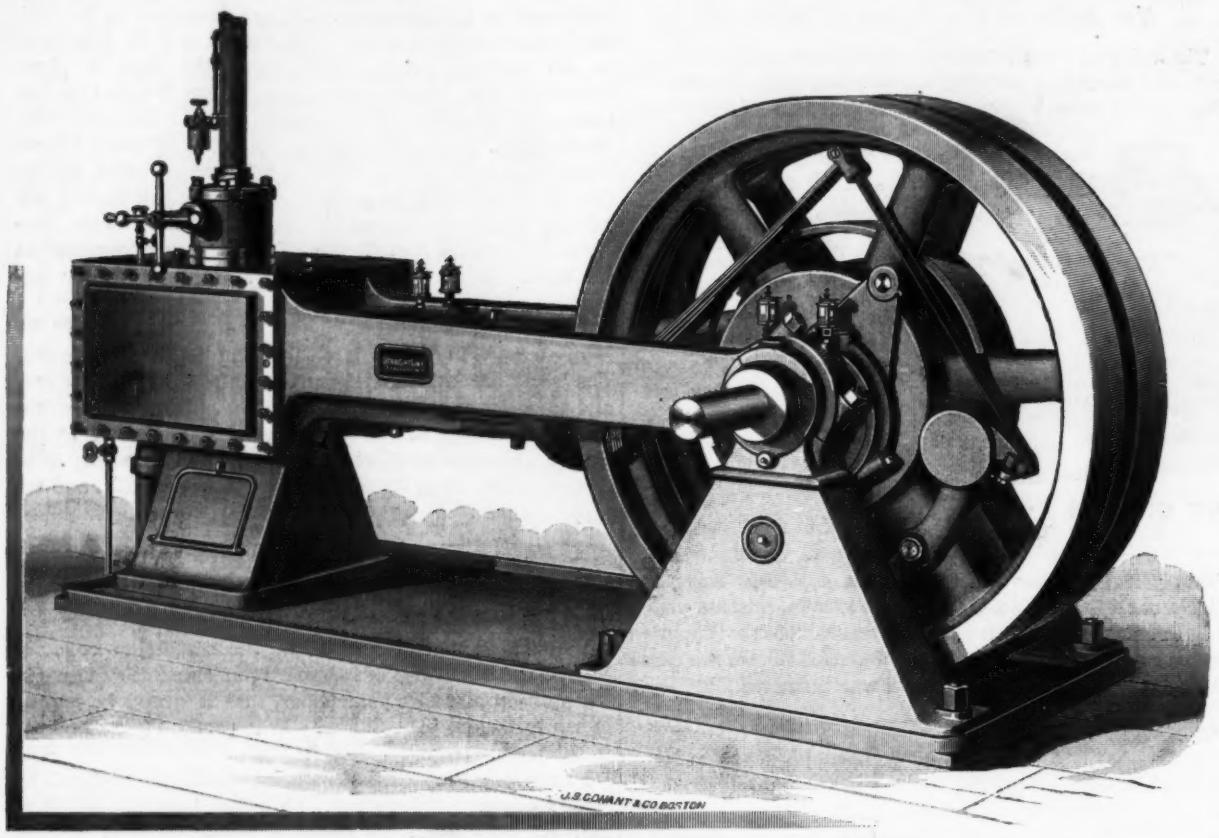


FIG. 1.—NEW STRAIGHT LINE 100 H. P. ENGINE.

The special feature of the 100 h. p. engine and of those of its type is that it has an independent exhaust valve; and there are new departures also in the form of the governor, and in the method of connecting with the valve. The engine has a 14 × 16 cylinder, which is square exteriorly as usual, and it runs normally at 220 revolutions.

As will be seen from Fig. 2, the steam and exhaust valves admit and exhaust over their ends, which permits of the arrangement that shuts off the live steam and also the exhaust steam from the cylinder along its centre. A fixed eccentric controls the exhaust valve, and with it the exhaust and compression; while a shifting eccentric, operated by a governor, operates the steam valve controlling the admission and cut-off. The connection between eccentrics and valves is quite direct.

It is to be noted that in this engine the lead is variable as well as the cut-off, in which respect it differs from others of its class, their lead being made as constant as possible. When taking steam at three-quarter stroke, which it does while yet under the control of the governor, there is a prominent positive lead, and, when cutting off short, either no lead or negative lead. The prominent lead thus given prevents thumping.

Among other points in the engine may be mentioned the fact that a thin, broad metal strap has been introduced in the place of links, to avoid the frictional wear and tear of link pivots and that of the governor pivot. This will be seen in Fig. 1, which also shows in perspective the manner in which the governor controls the shifting eccentric. The new engine is in fact a well-thought-out and well built piece of mechanism.

The Jamaica Electric Railway Re-Equipped.

There is no such thing as rest in the history of modern electric railway science. Each day brings forth some improve ment, and the leading electric supply companies are showing great zeal in bringing their apparatus and appliances up to the greatest modern improvement. For this reason a number of street railway companies, which have been equipped for two or three years on some of the old electric systems, are now discarding these and adopting the Sprague system. The Binghamton, Washington Street Asylum and Park road was one of these. This road was formerly equipped by an old style system, but has abandoned that and is now in operation on the Sprague system.

The Sprague Company has very recently closed another contract with a different company, which has also been in operation by one of the old systems, and which is to be brought up to the latest ideas in electric railway work. This is the Jamaica & Brooklyn Street Railroad, which will now be thoroughly re-equipped according to the Sprague system, and will operate 10 cars. The latest improvements and devices used by the Sprague Company will be adopted here, and the equipment of the road will be first class in every respect.

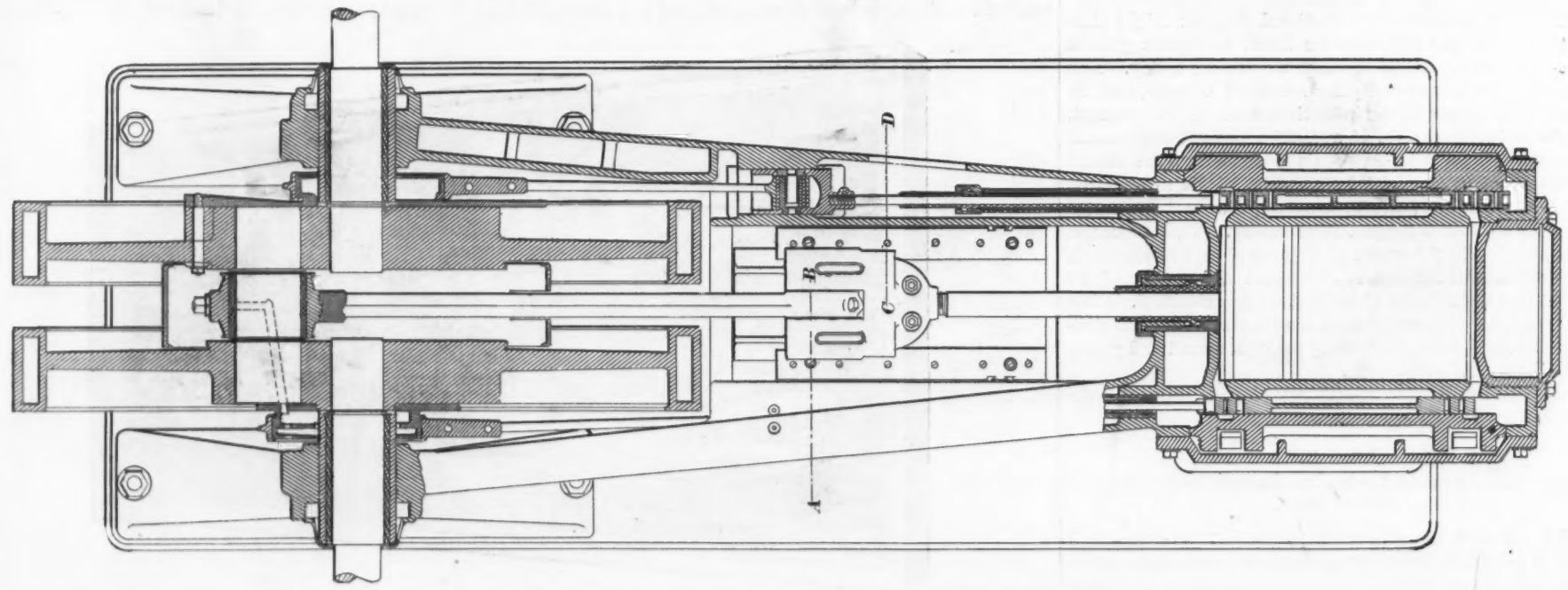


FIG. 2.—HORIZONTAL SECTION OF NEW STRAIGHT LINE ENGINE.

Practical Results in the Westinghouse Station at Bristol, Pa.

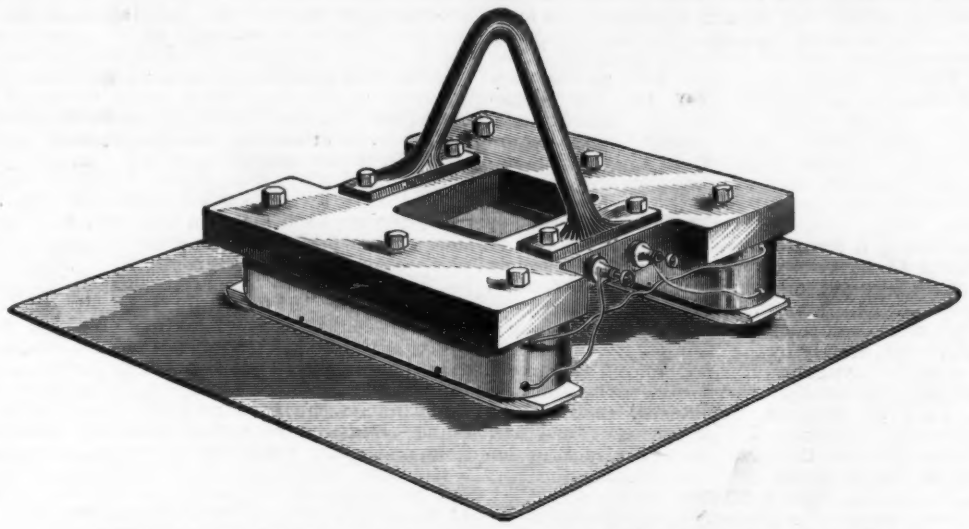
BY CHARLES E. SCOTT.

In view of the fact that we are constantly asked as to the Westinghouse alternating system which we adopted last November, and the efforts made by certain parties to discourage its use, I should like to state that we commenced the erection of our building, 30 × 52, last fall, placing therein an 80 h. p. boiler, a 45 h. p. Westinghouse standard engine, and a 500-light Westinghouse alternating current dynamo. We secured a five years' contract for lighting the town with 100 incandescent lamps of 25 c. p. each, requiring 11½ miles of No. 10 B. & S. wire, in five loops of 21 lamps each in series, from a 3,000-foot main of No. 6 B. & S. The additional 5 lamps were placed on the loops upon the supposition that the town would soon see the necessity for their continuance, which proved correct. Street lighting under the contract was started Feb. 13, under the supervision of M. R. Muckle, Jr., & Co., of Philadelphia, who had charge of our work, and who spared no pains to make it complete. At that time we had not a single commercial customer, there being a very evident prejudice against the system, induced principally by pamphlets scattered broadcast through the mails amongst our people—probably by advocates of other systems which we had investigated and condemned as unsuited for use in our town. In two weeks time we were so overrun with applications that we were forced to employ additional wiremen to expedite the work. We then purchased an additional Westinghouse standard engine and dynamo to duplicate our plant, and before July 1 we had one machine fully loaded. The heaviest commercial main is of No. 4 B. & S. wire. The street lamps now number 112, of which seventy have been burning all night, and every night without renewal, since Feb. 13, just six months ago, and they are in good condition yet. Of those which have been renewed, only eight failed to burn 600 hours, and eight were demolished by lightning, which struck a tree near the line and sent a ball of fire playing around the switchboard and out through the lightning arresters and ground detector, without injury to the machines.

We have never had a skip or break except the breakage of a wire on one of the street loops, which opened the circuit on that series temporarily. Our armatures are as good as when started. We have spent but 65 cents on repairs, that being for a new cylinder cock on the engine. Much of this success in long life of lamps and slight repairs needed we attribute to the excellent running of the Westinghouse engines and the thorough manner in which they were installed. Coal consumption has averaged 1,600 pounds per day, running an average of twelve hours per day. We have not had a single complaint from our customers as to quality or steadiness of light, and have detected no flaws in the system. The street converters are admirable arrangements for running in series, as the extinguishment of three or more lights is noticeable in the lower voltage of the remainder of the series, and the replacing of those which are burned out restores the rest to full candle power. The writer tested the force of the 1,000-volt current while tracing a cross between a street lighting loop and a fire alarm wire, but did not stop to inquire whether all or a portion of the current was passing through him. Beyond being knocked down, and kicked two or three times after he was down, no inconvenience resulted, except a natural chagrin at not having opportunity for revenge. We know that the primary current is dangerous, and we impress that fact upon the minds of the people. We are

just as fully convinced that the secondary current is harmless to the person, and infinitely safer as a fire risk than the continuous current systems. We also know that our furthest commercial lamp, supplied by a No. 12 primary wire, shows by the photometer that its candle power is equal to those near the station, and we believe that to obtain the same result with the continuous current would require an expenditure for wire almost equal to the cost of macadamizing the streets along the route.

Our plant was an experiment erected in the face of expected opposition from the local gas company; we put in it only an amount which we felt that we could afford to lose. It is now a success financially, and we trust it will remain so. In the light of our present experience, we would use the Westinghouse compound condensing engine instead of the high pressure, and would have a brick building instead of frame. The writer knows of no other changes which have been advocated by any stockholder or customer. We certainly would not exchange the Westinghouse system for any now existing.



BRUSH ELECTRO-MAGNET FOR LIFTING BOILER PLATES, ETC.

The Rulings at the National Electric Light Convention.

To the Editors of The Electrical World:

As objections have been raised to certain rulings of the chair at the recent convention of the National Electric Light Association, and as some have even stated that legislation was intentionally hasty and unfair, it seems proper to analyze the rulings in question, to show that the decisions were, in all important particulars, in strict accord with parliamentary law.

No subject ever brought before the Association has been more generally and perfectly understood than was the report of the committee on amendments to the constitution. Every member had, by means of circular letters, been given an opportunity during the past six months to express his views as to the needed changes. The replies received by the committee were almost unanimously in favor of the amendments as adopted.

These amendments were submitted to the convention article by article on the first day of meeting, and were made a special order of business for the third. Copies of the proposed amendments and also of the old constitution were distributed.

By reference to the minutes of Thursday's proceedings, it will be seen that after the re-reading of the amendments, a motion was made and seconded to accept the report of the committee. According to parliamentary law, to *accept* is to adopt [see Cushing, chap. XV., sec. iv., par. 295]; and the mover in this case, an associate member, stated to the convention that he used "accept" understandingly, and that the chairman put the question correctly; therefore, when the motion prevailed, the new constitution became the organic law of the association, and the chairman was obliged to decide in accordance therewith. An objection that the votes upon which it was carried were not counted to determine a two-thirds majority would have been valid. But, as the *viva voce* vote was unanimous, the point did not occur to the chair; and, as no objection was raised until long after the result had been announced and the house had proceeded to other business, it could not then be in order.

The idea of taking up the amendments *seriatim* was good, but it was presented in the form of a suggestion which was not accepted by the mover of the question under consideration. Even in the form of a motion it would have been out of order, as a motion was already before the house.

A motion for reconsideration was made; but as it came from one who admitted that he had not voted on the original motion, by parliamentary usage, it was not in order. [See Cushing, Chap. XV., par. 257.] The immediate presentation and seconding of a new motion prevented all further discussion of the previous question.

The point is raised that the decision of the chair deprived of franchise those who had paid dues for the present calendar year. This objection overlooks the fact that the associate members were seeking to control legislation providing for a meeting to be held nearly two months after the close of the calendar year, and, therefore, entirely beyond their jurisdiction, even had the amendments been formally accepted as taking effect at the expiration of the current year. Had this phase of the question occurred to the associate members, I am confident, in view of the generosity which they evinced in originating and carrying on the whole amendatory movement, that the feeling would have been quite different.

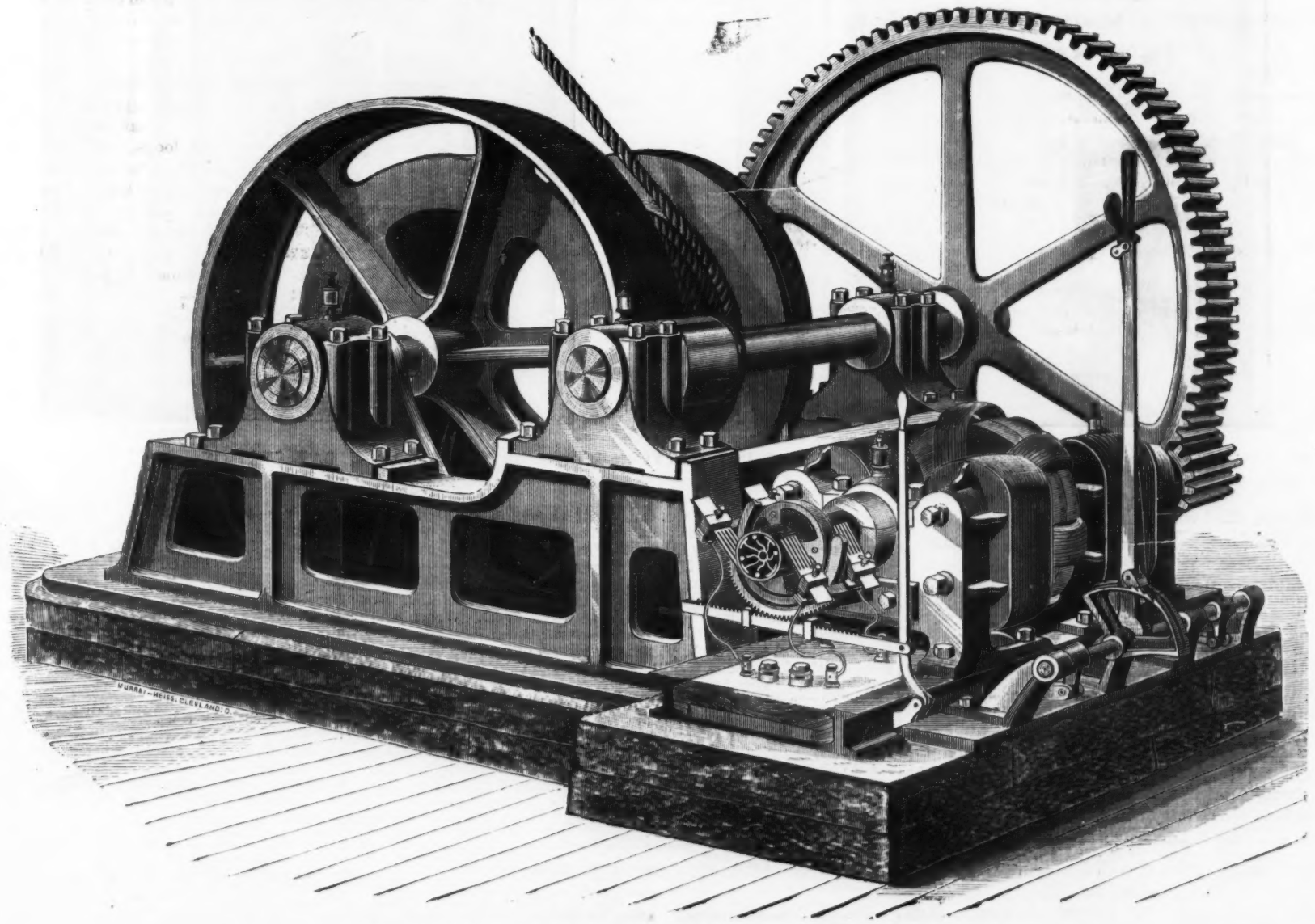
From the foregoing it appears that the efforts of the remonstrants were ineffectual through their own unparliamentary proceedure, not through unfair or illegal decisions.

When the excitement of the moment has passed, it must be recognized that the decisions of the chair were not only strictly legal, but just; and all will see that their interests still lie with the National Electric Light Association.

KANSAS CITY, Mo. EDWIN R. WEEKS.

New Brush Apparatus for Power Purposes.

We illustrate on this page two of the methods, both of them admirable, by which the Brush Electric Company, of Cleveland, has rendered the electric current available for general use. Fig. 1 shows a neat little piece of apparatus in the shape of an electro-magnet specially devised for lifting boiler plate, blooms, etc. As will be seen, by means of this new machine or appliance, large and heavy plates or other parts may be picked up and easily transported from one part of a shop to another. When the magnet is to be used, the current from the generator is thrown on, and when the work is done the current is at once switched off. The lifting power of this magnet is remarkable. It is in use by the Otis Iron and Steel Company, of Cleveland, and others, who find it very convenient.



BRUSH ELECTRIC HOIST FOR MINING AND OTHER WORK.

Fig. 2 shows the Brush electric hoist, with spur gear and friction for hoisting ore, etc. As will be noticed, the apparatus is very compact, the motor, of 15 h. p., being mounted on the same base as the Walker hoist, occupying

he minimum of space. The details of the arrangement will be readily gathered from the illustration. The Brush Company are paying special attention to this class of work, and, as the result of their great success with the plant at the Chollar mine, have made a number of contracts for electric power, including one of five 80 h. p. motors and five 130 h. p. generators for the copper mine of the Calumet & Hecla Company, at Calumet, Mich., where electric power will be put to a variety of work.

International Electrical Conference of 1892.

We have received the following important notification from Secretary R. W. Pope:

At the meeting of the Council of the American Institute of Electrical Engineers, held in New York, Aug. 6th, a resolution was adopted for the appointment of a committee of five, to be appointed by the president, to formulate a plan of organization for an International Electrical Convention, to be held in this country during the season of the World's Fair of 1892. At the meeting of Council, Aug. 14th, the committee was enlarged to fifteen and its work more specifically defined. The secretary was instructed to communicate at once with President Mascart, of the Electrical Conference at Paris, informing him of the action of the Institute, and suggesting that the work of the present conference be taken up at the proposed convention of 1892.

In accordance with previous action of the council the following delegates were appointed to participate in the Paris conference, all of whom are now in France or on the way:

Thomas A. Edison,
E. Wilbur Rice, Jr.,
Carl Hering,
Joseph Wetzler,
Nikola Tesla.

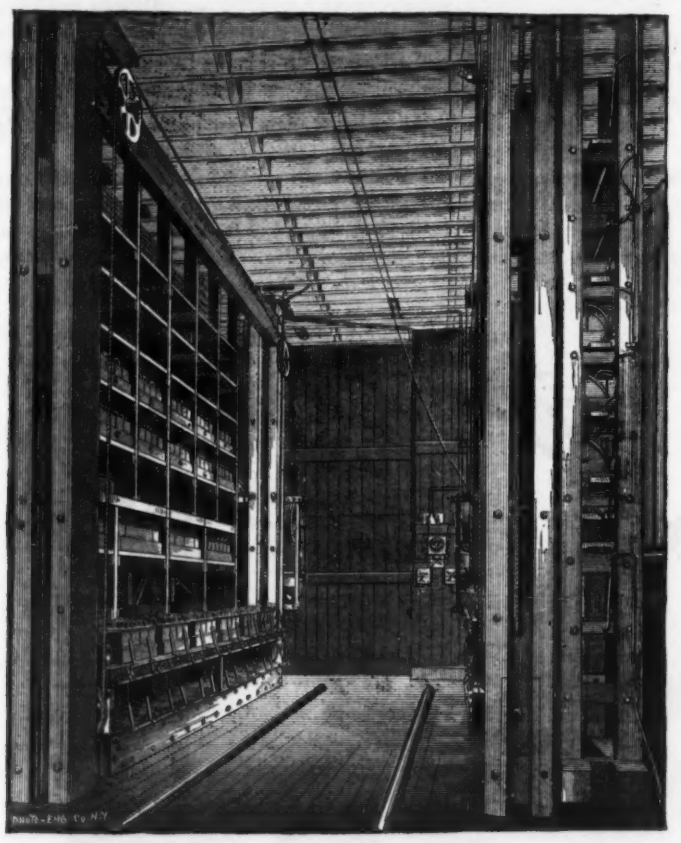
Vice-President Francis R. Upton, of the Institute, has also been requested to use his influence to secure the official sanction to an adjournment of the conference to meet in this country in 1892. President Elihu Thomson will in the course of a few days announce his appointments on the committee of fifteen, and the work of organization will be taken up immediately. The various electrical organizations throughout the country will be invited to co-operate.

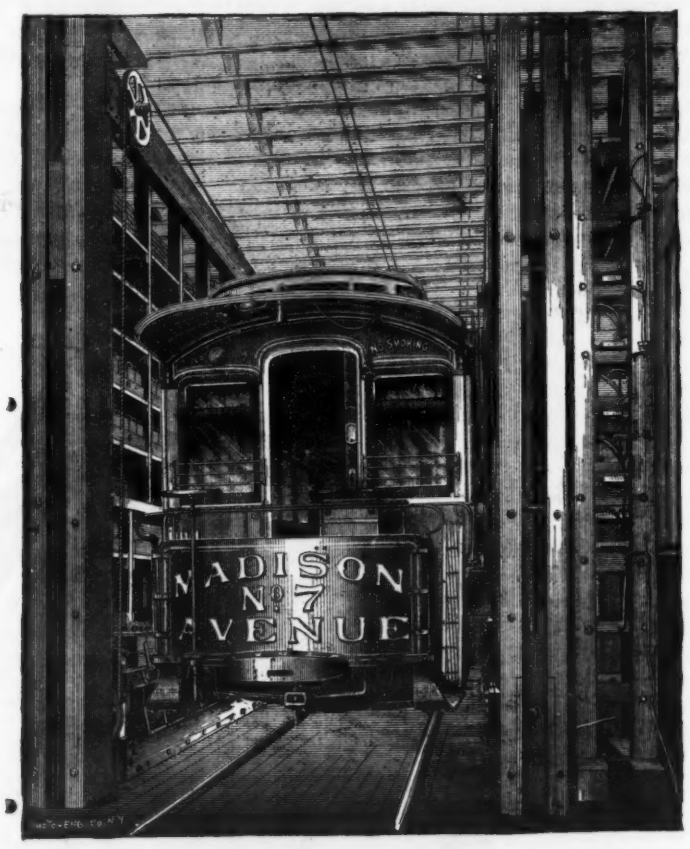
The Affairs of the Fort Wayne Electric Company.

The financial columns of the Boston newspapers state that Messrs. John M. Graham and R. T. McDonald, trustees, offer to the common stockholders of the Thomson-Houston Electric Company the right to subscribe to one-half of the full paid capital stock of the Fort Wayne Electric Company, namely, 60,000 shares of a par value at $25 each, at $12.50 per share, each common stockholder of the Thomson-Houston Company having the right to subscribe for one share of the stock of this company for each two shares he owns of the Thomson-Houston Company common stock. Subscriptions apply to stock of record Aug. 17 and will close Aug. 21, and are due and payable Aug. 26. Rights may be sold at the office of the International Trust Company at 10 per cent. of the price at which shares are offered, that is $1.25 each. The circular offering the stock says the Fort Wayne Electric Light Company succeeded the Fort Wayne Electric Company, which was organized in 1881. In 1887 it acquired valuable patents from Mr. M. M. M. Slattery. It subsequently purchased the entire assets of the Sun Electric Company, of Woburn, Mass., and the Slattery Incandescent Company, of New York, thus becoming possessed of everything of value that Mr. Slattery had ever produced. The Fort Wayne Electric Light Company defended and won the celebrated suit brought by the Westinghouse Electric Company against the Sun Electric Company, in which the Westinghouse Company sought to establish the Gaulard and Gibbs patent as controlling an alternating incandescent apparatus of the present type. The courts about the same time rendered a decision sustaining the Thomson-Houston patents covering automatic current regulation in arc light dynamos, which had been in litigation for a long time between the Thomson-Houston Electric Company and the American Electric Manufacturing Company. The Fort Wayne Electric Light Company, as well as other arc light companies, was embarrassed by this decision, and also found itself likely to be brought into conflict with some other early and important inventions of Professor Thomson in alternating current apparatus. Negotiations were therefore entered into between the Fort Wayne Company and the Thomson-Houston Company, which resulted in the Thomson-Houston Company acquiring a lease of the factory of the Fort Wayne Electric Light Company, by which said factory became one of the regular branch industries of the Thomson-Houston Company. This factory, having been burned in the fall of 1888, has since been rebuilt and remodeled on a much more extensive scale, largely by the munificent donations of the citizens of Fort Wayne, and it is now one of the largest and best equipped electric light factories in the world, and is supplied with all modern appliances, including a system of automatic sprinklers for protection against fire. The Fort Wayne Electric Company has a contract for disposing of the entire output of the Thomson-Houston Fort Wayne Electric Light Company factory, above described. Its business is very large and rapidly growing. It controls between 100 and 200 central stations, organized under the Fort Wayne "Jenney" system, and has acquired the right to supply the numerous central stations erected by the Van Depoele Electric Manufacturing Co. during the seven years of its existence. During the first six months of the present year the sales of Fort Wayne incandescent apparatus have, it is stated, nearly equaled those of the combined Thomson-Houston and Sawyer-Man sales for the same period during the year 1888. The company also controls a new arc light system, designed and patented by Mr. J. J. Wood, electrician of the old American Electric Manufacturing Company, and through him, it is asserted, owns and controls all the features of the American system that were of any value. The factory for the manufacture of Mr. Wood's apparatus, at Brooklyn, N. Y., is under his direct supervision. This branch of the business is absolutely owned and controlled by the Fort Wayne Electric Company, the manufacturing being carried on by it, and promises to be a very large and valuable part of the business in the future. The circular says this stock is offered to Thomson-Houston shareholders by preference, owing to the close relations existing between the companies.

Alternate Current Working.

Mr. Mordey, in his reply to the discussion on his paper on "Alternate Current Working," recently printed in these columns, says that he must venture to question the correctness of the theory of Dr. Hopkinson, but is prepared to qualify his statement by admitting that the most perfect alternator is one which has an indefinitely small self-induction and resistance; and this is further shown by the measurements of the self-induction of his armature by Prof. Ayrton's assistants. He goes on to state that there are many reasons why Dr. Hopkinson's theory is incomplete; notably, because neither its author nor any one else has based any practical advance on it. He objects to Mr. Swinburne's stating that he sees nothing in Mr. Mordey's interesting experiments which conflict with the recognized theory, after having seen a 50 h. p. synchronizing motor running with high efficiency under varying load, and designed on the lines of a direct current motor, and also to the statement that such machines as Mr. Mordey's would not run parallel without an "induction coupler," thus introducing self-induction. Mr. Mordey continues that it was a trial of this fact, and by means of a coupler which he had independently devised, that his eyes were opened to the whole fallacy, helping him to see that anything that prevented the instantaneous passage of the necessary correcting current must inevitably tend to prevent synchronous action. He dismisses the criticism of Prof. Adams, saying that it would cause him no surprise to find that the South Foreland experiments succeeded from quite different causes than those imagined, and fails to see the analogy between tuning forks vibrating in unison and alternators working parallel, when he had one machine working at 1,000 volts and the other at 2,000 volts, both being at the same speed, any more than a steam boiler at 120 pounds would be giving the octave of another working at 60 pounds; and further that the loud humming noise made by his alternators, when connected parallel and out of phase, is caused by the enormous rush of current, due to the comparative absence of self-induction, and that this puts the machine in phase with a jerk. In some machines, which cannot be injured by short-circuiting, there could be no such rush of current, on account of their great self-induction. He is greatly in favor of using an "earth" on the secondary circuit, stating that the supposed excessive strain on a 100-volt circuit, when grounded, does not exist in practice, as the secondary is grounded in the middle, so that the strain is really only 50 volts. He considers that Professor Fleming's objection to the substitution of the word "magnetization" for "induction" is not a very strong one. He states that for successful working the actual magnetizing and demagnetizing action of the armature on the field magnet should be small, the machine consisting of a very powerful electro-magnet, the field, and a very weak electro-magnet, the armature. Mr. Swinburne's statements that machines must have large self-induction to run parallel commercially, he disproves by the logic of facts, as shown by his machines, which have the lowest practical resistance and self-induction. The calculations of transformers, he claims, cannot be settled entirely on paper. The engines driving his two alternators in the experiments were not governed automatically, but controlled simply by hand. Mr. Mordey does not consider that machines should be invariably worked in parallel, but arranged according to the conditions, and if they are suitable for parallel work, the mains can be connected to a common or omnibus pair of terminal bars.





FIGS. 1 AND 2.—METHOD OF SHIFTING BATTERIES IN A JULIEN STORAGE CAR STATION.

Battery Shifting Devices for Julien Cars.

We illustrate on this page, in Figs. 1 and 2, the battery-shifting devices used by the Julien Electric Traction Company in connection with the station and cars on the Fourth Avenue road in this city, an article upon which appears on page 124 of this issue. As will be seen, the car runs into a commodious recess or pocket, and is there quickly relieved of its discharged batteries and filled with those newly charged, from the racks.

Preparations for the Telephone Convention.

General Barney, secretary of the National Telephone Exchange Association, announces that the special vestibule train for Minneapolis is now an assured fact. It will positively leave Jersey City at 9:15 A. M. on Sunday, Sept. 8. Passengers must leave New York by either the Cortlandt street or Desbrosses street ferries not later than the 9 A. M. boat. New England delegates arriving by the Fall River line can be transported to Jersey City direct from the steamer by the Annex boat.

This train is guaranteed to be the finest ever run out of New York; it will run through to Minneapolis without change. It will be accompanied by an agent of the Pennsylvania Railroad Company, who promises to leave nothing undone to promote the comfort and pleasure of the party, which already includes twelve ladies. A few berths are not yet assigned, and may be secured by an early application to the secretary.

The train will take on passengers at Philadelphia, Harrisburg, Altoona and Pittsburgh, and arrive at Chicago about 9 A. M. on Monday, Sept. 9th. That day will be spent in Chicago until about 5:30 P. M., when the start will be made for Minneapolis, which latter city will be reached at 8 A. M. Tuesday, Sept. 10, the opening day of the convention.

The fare from New York to Minneapolis will be $38.50, which includes sleeping berth. This is the lowest rate on the ordinary trains, the tickets on the fast "Chicago limited" being higher.

Annual Convention of Edison Illuminating Companies.

ORGANIZATION.

The importance of occasional conventions of those engaged in modern electrical enterprises can hardly be over-estimated. Meetings of the telephone managers inaugurated early in the history of that business suggested gatherings of those whom the electric light industry had brought into this field of work. It is now four years since a few representatives of constructing firms and of the parent organization held a somewhat informal session, and organized as "The Association of Edison Illuminating Companies." Arrangements were speedily made for semi-annual sessions, which have since been held in February and August of each year, until at the last meeting at Kansas City the by-laws were modified so that hereafter annual sessions will be held in the month of August. The tenth semi-annual convention was appointed to meet at the International Hotel, Niagara Falls, Aug. 13, and their deliberations opened at that place at 2 o'clock P. M. last Tuesday. Mr. John I. Beggs, of the New York Edison Illuminating Company, who has for the last three years presided, being in the chair.

Mr. Beggs said, in opening: "It should be a matter of mutual gratification to the delegates, on meeting so far from the scenes of the individual interests of most of the members, to find so good a representation of the Edison industry of the country. In modifying our methods of procedure last February by arranging for the holding of annual instead of semi-annual sessions, as heretofore, it was considered that a decided advantage would be gained in the comprehensive character of the deliberations, and that a better attendance would undoubtedly be secured by fixing upon a locality which in itself was central, and possessed such natural attractions as would make it pleasant as a place of summer entertainment. We are therefore here to-day with the purpose of prolonging the sessions of this convention if necessary beyond the usual limits of time allowed, and it is particularly the intention of the chair to give the greatest latitude in discussions in order that no opportunity may arise for a feeling on the part of any of the delegates that the subjects which may come up for debate have not been adequately considered. Inasmuch as a year will elapse before another convention, and particularly in view of the fact that since our last meeting important changes, anticipated for many months, have been consummated in the consolidation of the executive and manufacturing branches of the parent company, it seems to me particularly desirable that our proceedings at this time shall be reported with more than ordinary care and minuteness. Owing to a change in the character of his duties, which have always been numerous and arduous, the gentleman who has for three years acted as secretary of the association has felt compelled to tender his resignation, which was received some weeks ago, to take effect at this time. Anticipating the importance of this occasion, I have, with the approval of the executive committee, requested Mr. W. J. Jenks, of the parent company, to make provision for the proper recording of the doings of the association and act as secretary until the election of officers, which is one of the first items of business on our schedule.

"It is a matter of gratification to every member that we have with us the leading executive officers of the new Edison General Electric Company, together with Mr. E. H. Johnson, of the Edison Electric Light Company, who is here to acquaint us with the progress of the patent litigation."

The following members presented their credentials and were admitted to the floor at the opening session:

Edison General Electric Company, J. H. Herrick, Vice-President.

Edison Electric Light Company, E. H. Johnson, President; J. H. McClement, Comptroller; W. J. Jenks and Charles Wirt, Technical Department.

United Edison Manufacturing Company. H. Ward Leonard, General Manager; Edison Machine Works, Samuel Insull, General Manager; Montgomery Waddell, Philip Seubel, James F. Kelly, New York Agency.

Edison Lamp Company, John W. Howell, F. E. Jackson, Charles A. Gundaker.

Edison Laboratory, A. E. Kennelly.

Wilson S. Howell, Inspector of Central Stations.

John I. Beggs, V. P. and G. Mgr. Edison Electric Illuminating Co., of New York.

A. L. Smith, Pres. Edison Electric Light Co., of Appleton, Wis.

A. F. Walker, Supt. Edison Electric Light Co., Grand Rapids, Mich.

Maurice Hooper, Supt. Edison E. L. Co., of West Chester, Pa.

W. M. Brock, Gen. Man. E. E. Ill. Co., of Paterson, N. J.

S. R. Mumford, Director and Treasurer, E. E. L. Co., Detroit, Mich.

Hoyt Post, Director and Atty., and C. P. Gilbert, Sec. and Man., also of the Detroit Co.

W. T. M. Mottram, State Agent, Dallas, Tex.

A. F. Dow, Treas., E. E. Ill. Co., Fall River, Mass.

Thos. P. Merritt, Pres. E. E. Ill. Co., Reading, Pa.

C. L. Edgar, Gen. Supt. E. E. Ill. Co., Boston, Mass.

Leigh Carroll, Pres. and Gen. Man. E. E. Ill. Co., Birmingham, Ala.

Geo. H. Finn, Sec & Treas. E. E. L. & P. Co., St. Paul, Minn.

E. L. Bemiss, Gen'l Mgr. E. E. Ill. Co., New Orleans, La.

E. R. Weeks, Gen'l Mgr. E. E. L. & P. Co., Kansas City, Mo.

Lewis Lusk, Pres. and Treas. E. E. L. Co., Antigo, Wis.

John R. Markle, Pres. Markle Engineering Co., Detroit, Mich.

Geo. W. Palmer, Jr., Mgr McKeesport Light Co., McKeesport, Pa.

J. Edwin Giles, Supt. E. E. Ill. Co., Hazleton, Pa.

W. F. Wollin, Supt. E. E. Ill. Co., York, Pa.

C. J. Field, Gen'l Mgr. E. E. Ill. Co., Brooklyn, N. Y.

Chas. Wustenfeld, Mgr. Edison E. L. Co., Elgin, Ill.

J. B. Skehan, Treas. E. E. Ill. Co., N. Y. City.

H. L. Brewster, Treas. E. E. Ill. Co., Rochester, N. Y.

J. L. Jamieson, Sec. and Treas. E. L. & P. Co., Mt. Holly, N. J.

L. Stieringer, Edison General Electric Co., New York.

W. D. McQuesten, Contractor, New York.

Many of the delegates were accompanied by members of their families, and the sessions of the convention were so arranged that a good opportunity was afforded for pleasure and recreation.

After the roll-call the president read the following letter:

"I hereby tender my resignation as secretary of the Association of Edison Illuminating Companies, the same to take effect Aug. 13, 1889. I have served in this position for several years, and as my daily business in connection with electrical matters is constantly on the increase, I do not feel that I can in any way be considered as a candidate for the position in future. I therefore request that this resignation will be accepted. Yours truly, J. H. VAIL, Sec'y."

On motion of Mr. Weeks, the chair appointed a committee of three, consisting of Messrs. Jenks, McClement and Weeks, to draft suitable resolutions expressing the sense of the association for the faithful and efficient work of Mr. Vail in the past. They reported the following, which was unanimously adopted:

WHEREAS, Mr. J. H. Vail has found it necessary to withdraw from the office which he has filled during the past three years, therefore, be it

Resolved, That this association has the fullest appreciation of its indebtedness to him for his able and conscientious services, and deeply regrets the loss which it suffers in accepting his resignation.

Resolved, That the secretary be instructed to forward a copy of this resolution to Mr. Vail.

The following were elected as officers for the ensuing year:

President, John I. Beggs, of New York.

Vice-President, C. P. Gilbert, of Detroit.

Secretary, W. J. Jenks, of New York.

Treasurer, Wilson S. Howell, of New Brunswick, N. J.

Executive committee: A. L. Smith, Appleton, Wis.; C. L. Edgar, Boston, Mass.; Thos. P. Merritt, Reading, Pa.; E. R. Weeks, Kansas City, Mo.; C. J. Field, Brooklyn, N. Y.; John I. Beggs, New York, *ex-officio*.

This is the fourth successive annual election of Mr. Beggs as president, and expresses more emphatically than any specific comments the efficiency of the service which he has rendered in this capacity.

THE REORGANIZED PARENT COMPANY.

Mr. Edward H. Johnson, being introduced by the chairman, spoke as follows: "I think it is perhaps wise, just at this moment, to make a statement as to why Mr. Herrick is here. You are all aware, of course, of the fact that up to the present time the officers of the Edison Electric Light Company have had to create the interests you represent without money of their own, and in fact have gone into the field simply on the merit of what they had to present. They have created this industry in a very wide field, as the geographical distribution of your stations plainly indicates—in fact, have established the Edison business on a permanent basis. But it has been recognized during all that time that had the Edison Electric Light Company been organized on a different plan, in fact been organized with capital of its own to be used for the purpose of establishing these industries, much greater progress would have been made, and we should to-day have five or six hundred representatives here instead of this number. That fact, together with the other equally important one that the company had made all the money that it did secure from the sale of machines and patent appliances, decided the management to consolidate the many interests, thereby enabling them to show that a dividend could be earned, and also to enable them to conduct the business of construction and operation with capital of their own.

"About a year ago we started in for the purpose of bringing about that revolution in the Edison business which is now fully accomplished. The Edison Company is to-day in the position that some of its competitors have been in for some time past—namely, standing ready to go into the field to compete for business upon a commercial basis with the sinews of war behind it.

"In the reorganization of the Edison business most of the competent executive officers, engineers and technical men of all descriptions have been retained. Other men have come in who represent new capital, instilling new blood into the enterprise, and altogether the company is now in a position to deal with the questions of competition created by parties who have appropriated and are using (pending the decisions of the courts) methods of which the genius of Mr. Edison has made us proprietors."

Mr. J. H. HERRICK, Vice-President of the Edison General Electric Company, and President of the United Edison Manufacturing Company, was then introduced. He said: "Mr. President and gentlemen: It is a source of great satisfaction, and also a source of great embarrassment to meet these gentlemen who are so intelligent and so well informed in this business. To me this is a new platform. I come upon it anxious to learn the principles of electricity, and to profit by the work of this convention, but primarily, I presume, some idea of the future policy of the company from a purely business point of view is expected.

"It is very much easier to lay out a plan of campaign than to carry it into effect. In giving you a sketch of what is proposed, of course such a sketch will be subject to such modifications as the future may render either just or desirable. The growing commercial value of the Edison system of electric lighting attracted the attention and careful consideration of capitalists. An investigation of the validity of the patents, the probability of sustaining them and thereby insuring a practical monopoly of incandescent lighting, together with the impression that a consolidation of the Edison interests would thereby produce economy in its management, its general expenses, etc., led certain gentlemen to endeavor to bring about a consolidation of the various companies, which, after several months of negotiation, was finally accomplished. The Edison General Electric Company is now practically the owner of all of the companies covering the Edison system of incandescent lighting. The relation which this company will now hold toward the illuminating companies, will, as I understand it, be divested to a very great extent of the parental feature which has been admirably sustained in the past. It is better, it seems to me, that the parental position should be succeeded by a purely commercial one. It is hoped that the relation of the illuminating companies and the patrons and believers in the Edison system throughout the country will be wholly and purely on a friendly commercial basis. Believing that to be for your best interest and the best interest of the general company, we have decided to maintain it for the mutual advantage of all of us. The organization of the company has been made in this way; the General Company may be said to take the place of the Edison Light Company, with the additional advantage of controlling all existing interests.

"To take charge of the executive management of all the departments of the business another company has been organized, the United Edison Manufacturing Company, under the control of the Edison General Electric Company.

"Its revenues will ultimately go into the treasury of the General company. It will be conducted by gentlemen who are familiar with the exigencies of the business and its wants. The patent litigation I believe it is intended shall be prosecuted with more vigor than in the past, and it is hoped that instead of being partly on the defensive we may become wholly aggressive litigants, and that we may not only sustain the fundamental patents, but also the large number of subsidiary patents which shall put us in a position to assert the right we believe to be ours, and which right we believe will in time be sustained by the courts of justice. As to the commercial aspect: A very large saving will be made in the expense of the company's management. That will enable the company to sell its goods at a more reasonable rate. It is the intention, in so far as the commercial necessity of the case requires, to reduce prices on all electrical apparatus. One of the very earliest efforts of the company was to get what was earnestly requested and freely debated at the Kansas City meeting, a reduction of the price of lamps. It is also expected that while this reduction as applied to isolated work has been large, a certain proper reduction shall be made to the illuminating companies, as it is the effort and intention of the General Company to place our central stations in a position to compete with any lamp in the market. I am credibly informed and believe that a further advance in the efficiency of the lamp will be made, and that thus the Edison lamp will be the cheapest as well as the best in the market. In regard to its isolated business. It is believed that the general system for the construction and installation of isolated plants can be more effectually and economically operated under one general organization. The company will, therefore, seek to take charge of that business throughout the country, and do its own work of installation. We have been led to take this step from the fact that frequently installations were made which were defective and which injured the station in that locality, as well as the system generally. This we seek to avoid, and are determined to do the work in the best possible manner at the lowest possible price. By this arrangement we believe that the illuminating companies will be the gainers, as arrangements will be made that will be entirely satisfactory as an equivalent for the limited profits which have heretofore been secured by the local companies who have installed these plants themselves.

"In a word, the general idea is to consult and harmonize all the interests connected with the Edison system, and, by cheapening the cost of production, benefit the general public, as well as the illuminating companies.

"I am very much pleased to have been able to meet the gentlemen of this association, and trust that everything which has been proposed may be consummated to your benefit as well as to that of the General Company, and that the pleasant associations which I have formed at this convention will long continue."

The relations of the parent organization and its licensees and agencies were discussed by John I. Beggs, of New York, who introduced several important questions as to the future policy of the newly organized General Company, and pointed numerous examples of the practical outcome of past methods of dealing with local organizations which, in his view, should serve to shape future negotiations. The matter was taken up by Messrs. Johnson, McClement, Leonard, Edgar, Herrick, Post, Mottram, Smith, Carroll, Markle and others. The discussion was very animated and was finally settled by the assurance of Mr. Herrick that in the arrangement of the general policy all available information would be considered and all practical ideas given proper consideration, to the end that the greatest mutual advantage may be secured.

Mr. E. H. JOHNSON made a deeply interesting statement of the condition of the litigation to establish the validity of the Edison fundamental patents. The exact present status of the filament, fibrous carbon, feeder, three-wire and other important patents was taken up in detail and a comprehensive idea conveyed to the association of the determined spirit shown by the Edison Electric Light Company (which still maintains its organization for this purpose) in forcing these questions toward ultimate and speedy decision. It was specially brought out that in three of the most important suits the records and arguments are in the hands of the judges, and decisions are expected at any moment. These include the suit entered by the Sawyer-Man Company against the McKeesport (Pa.) Light Company, in which the burden of the defense is assumed by the Edison parent organization.

It should be noted, as a matter of special encouragement to the Edison fraternity, that in the examination into the validity of the Edison patents and the prospects for establishing their comprehensive claims in the courts, made in the most careful manner by the shrewd business agents of the powerful German syndicate (including the world-renowned electrical firm of Siemens & Halske), whose capital has now been allied with that of the original American investors, the most complete confidence was seen to be justified, and that this proved a powerful factor in effecting the consolidation of interests which is now consummated.

Mr. Johnson especially emphasized the determination of the company to immediately take up and press with all possible urgency suits upon the numerous subsidiary patents which have been so generally and recklessly infringed by competitors.

The number of papers submitted to the convention was unusually large and valuable. For reasons which have influenced the association in restricting the attendance upon its meetings to the legitimate membership, much of the practical material embodied in these papers is not given to the public. Their general character and scope will, however, be indicated by outlines and extracts.

The following paper was then presented by Mr. A. E. Kennelly:

THE HEATING OF CONDUCTORS BY ELECTRIC CURRENTS.

Mr. Kennelly stated in presenting his paper to the association: "Not very long ago the Edison parent company desired to know more fully than it had the means of knowing at that time the exact conditions of safety as regards the carrying capacity of conductors used in electric light work and the transmission of electrical energy for power purposes. The subject was first suggested specifically to the Standardizing Bureau by Capt. William Brophy, of the New England Insurance Exchange, who pointed out certain inaccuracies and omissions in the existing tables used by the various electric companies in wiring buildings and forming the foundation of the rules of the exchange under which these companies are operating.

"It is, of course, a very important subject, and when the insurance people applied to the Edison Electric Light Company for information, it was unable to give full and complete details of what sizes of wire should be considered perfectly safe for any given current under any given conditions in household work. Thereupon the Light Company had carried out at Mr. Edison's laboratory in Orange a series of experiments which have resulted in putting the company in possession of more full information upon this and kindred points than is to be found anywhere else in the electrical world at this moment.

"In these experiments we adopted the course of putting twenty-four wires of different sizes in actual paneling. Various currents were then sent through these wires, the highest being 300 ampères, which was considered a maximum for general interior work. Observations were made as to the temperature resulting from these various currents. The highest temperature reached was 100 degrees C., or about 180 deg. F. above that of the surrounding air of the room. This was reached by number 26 B. W. G. wire with nine ampères. As the wires grew bigger and bigger the temperature lowered correspondingly with the same current until with the largest wire only 40 deg. C. was reached with 300 ampères. By taking these results, we can find what temperature will be reached by any current on a given size of wire under ordinary conditions. The important question arises as to what is considered a safe temperature. You might allow a wire in your cellar to rise 150 deg. F. above that of the surrounding air, which might be 40 deg.; that would be in all 190 deg. You could not allow at the ceiling of your parlor, where there might be an existing temperature of 100 deg., 150 deg. more on top of that without a source of danger."

The following are a few extracts from the introduction of the paper:

The subject of the dimensions which a conductor should possess for the economical transfer of a certain quantity of electrical energy to any given distance is of paramount importance to the electrical engineer. Among the leading pecuniary considerations involved, namely, the price of power, cost of the conductor, together with its maintenance, and the rate of interest and depreciation on its value—factors which under certain known reservations are economically connected by Sir William Thomson—the amount of a current which a conductor can safely carry without overheating is not taken into account, for the reason that under existing prices, and with ordinary current strengths, the strictly economical conductor is of such a cross-sectional area that its overheating can only be due to unforeseen and accidental causes. There are, however, in practice very many cases where economy is not the first consideration, or where the limits of economy have been necessarily exceeded, as, for example, the ordinary case of maintaining a constant difference of potential over a system of electric light mains under all conditions of variation in load, conditions which may and often do test the carrying capacity of parts of the system to their limits, and thus the necessity of knowing the safe limit of load upon any conductor has become fully recognized.

Notwithstanding the importance of the subject, our generally available knowledge of the safe limits of conduction has hitherto been but scanty. This has been partly due no doubt to the exceedingly rapid development of the science and art of electrical transference of energy, and the more pressing need for all the activity of its votaries in the other more advanced directions; also the complication and difficulty which beset all problems connected with the movement of heat has no doubt had its share; but the facts are that up to the present time we have not known with any pretension to accuracy what degree of elevation in temperature would be produced in a conductor by the continued passage through it of a given current strength and as to how that temperature will vary with the insulating covering of the conductor or its environments.

The only important contributions to the subject seem to have been embodied in two very excellent papers, one read by Mr. W. H. Preece before the Royal Society of Great Britain, in which the current strengths required to fuse wires of different metals and diameters is ably determined and discussed, and the other read by Prof. George Forbes, before the Institute of Electrical Engineers, London, in March, 1884, in which the subject is fully considered from a theoretical point of view. Professor Forbes seems, however, to have had little experimental data at his command at that time, only fifteen actual observations being given; and although the formula and calculations are mathematically unimpeachable, the results are wide of the mark, owing to the fact that the coefficients of cooling taken by him in the absence of direct observations were determined under other conditions and were not fairly applicable. This Professor Forbes himself suspected, but was unable to remedy.

The general state of our knowledge up to this time can best be reviewed by an examination of the current rules and statements in the latest books of electrical engineering. In this year's edition of Munro & Jamieson's pocket book, the only rule given for electric lighting leads is for ship use, viz.: One square millimetre of section for every ampère and a half of current. This is equivalent to about 970 ampères to the square inch, or 1,315 circular mils to the ampère. That is certainly a safe conductor up to a diameter of half an inch under practical conditions, but it is not by any means an economical rule for wires less than half an inch in diameter. The British Board of Trade rule requires 2,000 ampères per square inch for currents up to ten ampères, and 1,000 ampères per square inch for currents above ten ampères. To this rule similar remarks apply.

To determine the safety limits of conductors under practical conditions by actual trial, a series of experiments has been made for the Edison Electric Light Company at Mr. Edison's laboratory, Orange, N. J., and the results obtained not only enable us to predict with very fair accuracy the carrying capacity of any ordinary conductor for house wiring or overhead purposes, but have also elicited several matters of interest and value.

The experiments were naturally divided into three parts, to be described separately.

1. The heating of copper wires, both bare and insulated, incased in wooden molding to represent house wires.

2. The heating of copper wires, both bare and insulated, suspended on poles in the open air to represent overhead wires.

3. The heating of copper wires and strips suspended across a room to represent the conductors in an electric light station and also to form a connecting link between the two previous conditions.

The rule recommended by the committee of the London Institution of Electrical Engineers for the prevention of fire risks in electric lighting as published last year was: "That the conductivity and sectional area of any conductor should be so proportioned to the work it has to do that if double the current proposed is sent through it, the temperature of such conductor shall not exceed 150 degrees F." Assuming, in the absence of reasons to the contrary, that this rule is the best to adopt, and, taking the mean temperature of the air in a house surrounding a panel as 75 degrees F., the rule demands that the temperature elevation shall not exceed 75 degrees F. or 41.7 degrees C. It is thus the proposal of this paper to fix the safe current as that whose double will bring the temperature elevation to 40 degrees C.

The table appended shows that whatever temperature be adopted as the safety limit, the principle of fixing the diameters of conductors by allowing a certain number of ampères to the square inch or a certain number of mils to the ampère can only be very imperfect, unless a sliding scale be arranged. Thus the diameter of wire which just falls upon the Board of Trade rule is 0.505 inch for 200 ampères. According to the plan here adopted this rule would not be a safe one beyond that diameter and current, while for smaller wires it would, so far as safety is concerned, be very uneconomical.

A wire in wooden paneling when heated by a current is cooled by convection under complex numerical conditions. As the temperature of the wire and panel rise, radiation and convection gradually come into play.

A bare wire in the still air cools by radiation and convection. The radiation follows along the law of Dulong and Petit, and is given in the accompanying table and curves. It varies also with the surface nature of the wire, and also, strictly speaking, with the surface natures of the bodies by which the wire is surrounded

A bare wire in air out of doors is subject to a very great increase of convective cooling even in calm weather.

The paper was not read by Mr. Kennelly, but filed for action by the company. It was a very lengthy one, and contained valuable diagrams, curves and tables, and was considered a very valuable addition to the company's technical literature. Discussion on the points brought out was participated in by Messrs. Johnson, Wirt, Field, Insull, Mottram, Merritt and Carroll.

The next paper of importance was by Mr. Leigh Carroll, of Birmingham, Ala., entitled.

THE MAXIMUM EFFICIENCY OF INCANDESCENT LAMPS FOR CENTRAL STATION WORK.

The scope of this paper may be inferred from the following extracts: "This question, so far as it has to do with the Edison lamp, is one which has already received such exhaustive treatment by Mr. John W. Howell in his paper before the Institute of Electrical Engineers, April 14, 1888, and later by the Edison Lamp Company in a paper over Mr. Edison's signature read at the last meeting of this Association, that there would seem to be little left to discuss. An interested listener to Mr. Edison's paper at the

last convention and to the discussion that followed it, my attention was particularly called to the apparent unwillingness of the convention to accept the results reached by Mr. Howell and Mr. Edison, though the experimental and theoretical determinations of Mr. Howell were substantiated by the mathematical determinations of Mr. F. E. Jackson, and these same results were found by Mr. Edison's investigation to be reached in practice. Those who are familiar with Mr. Howell's paper will recollect the law as stated by him to be as follows: "The point of maximum efficiency is reached when the lamp bills are about 15 per cent. of the total operating expenses of the station." It is the correctness of this law as applied to central stations that we propose now to consider.

Following out Mr. Howell's line of thought, we find the total cost of operating lamps to be made up of two parts:

1. The cost of current.
2. The cost of the lamps.

This current cost is made up of every expense incurred in producing the current, and properly includes material and supplies consumed, labor, taxes, insurance, salaries, rent, interest and all fixed charges of every description.

If, however, we examine these items, we shall find that they consist of two distinct classes:

1. Those that vary with the amount of current produced.
2. Those that do not, but are practically constant without regard to the current output.

Thus among those expenses that are practically constant we will find all fixed charges, such as interest, rent, insurance, taxes; also nearly, if not quite, all the labor and salaries, since a station must always be ready to handle business.

The variable items are supplies such as coal, water, oils, etc., and minor expenses. This latter class varies in practically a direct proportion to the current output.

The lamp breakage varies in conformity with the law obtained by Mr. Howell, that the life of the lamp in hours is equal to the sixth power of its efficiency expressed in Watts per candle. Using Mr. Howell's notation, and modifying it to conform to the divisions of cost as given above, we would have:

$$T = \text{total cost} = C + L \text{ where } \begin{cases} C = \text{current cost,} \\ L = \text{lamp cost,} \end{cases}$$

$$\text{and where } C = C^k + C^v$$

$$\text{when } C^k = \text{constant current expenses}$$

$$\text{and } C^v = \text{variable current expenses.}$$

$$\text{Or } T = C^k + C^v + L.$$

Also, $T^v = C^v + L$, or total variable cost = variable current cost + lamp cost.

To illustrate how the ratio between the constant and variable parts of the current cost will affect the total current cost under varying current output we will take two cases of opposite character:

1. A. Constant expenses large;
   B. Variable expenses small
2. A. Constant expenses small;
   B. Variable expenses large.

A central station belonging to the first class will be one where power is very cheap, or costs nothing at all—owns its water power for instance—whose plant is well managed, which uses but little oil, etc., and has but few repairs. Under these conditions the total cost will vary but slightly, whether there is one lamp in a circuit or a thousand. But while the total current cost varies but little, the cost per lamp, or per horse power per hour, will vary largely with the current output.

Thus, suppose 2,000 h. p. hours per month cost $400, of which $360 are for constant expenses and $40 are for variable expenses. Here the current cost per horse-power hour is 20 cents. If, however, we increase the output to 4,000 h. p. hours, the expense becomes $440, of which $360 are for constant expenses and $80 for variable. Our current now costs only eleven cents per horse-power hour.

A station in the second of the above classes will be one where the fixed charges are small, salaries low and labor cheap. But fuel and water are high, or perhaps power is rented at a fixed price per horse-power hour, so that the cost increases directly with the output.

Thus reversing our figures about, suppose 2,000 h. p. hours per month to cost $400, of which $40 are for labor, salaries, taxes, etc., while $360 goes to pay for fuel, water, etc., the cost would be as before, twenty cents per horse-power hour.

Increasing the output now to 4,000 h. p. hours, we would have total cost $760, of which $40 would be for constant expenses, while $720 would go to variable expenses. In this case the cost per horse-power hour would be nineteen cents, as against eleven cents above, a widely different result.

Hence care must be taken in dealing with the question of cost per horse-power hour under varying output of current, to examine and to divide it into its component, constant and variable elements, and base our determination upon the relative value of each.

This paper was also long and exhaustive. A spirited discussion, participated in by Messrs. Howell, Jackson, McClement, Wirt, Beggs and Smith followed the reading, illustrating the difficulties found in the arrangement of an equitable basis for the calculation of conditions which should govern in central station practice. It was desired that Mr. John W. Howell should take time to consider the subject carefully, and if necessary, formulate a modification of his original paper, which would reduce it to a practical rule for the use of managers of central stations.

One of the most interesting papers to a majority of the delegates was a paper dealing with many practical questions of every-day importance to managers of both large and small central stations, through primarily addressed to the latter class. It was entitled

PROMINENT PERPLEXITIES WITH STATION MANAGEMENT,

Presented by Wilson S. Howell, who has for the past three years been employed in traveling from one station to another in response to calls for systematic inspection and advice as to the equalization of pressures, enlargement of business, reinforcement of conductors, and kindred subjects requiring thorough and practical knowledge of the details of the business.

Among the numerous points touched upon was that of the use of 110-volt motors on three-wire systems as a fruitful source of trouble, bad balance, and excessive losses in certain areas; questionable practices in the interior wiring of buildings; improper placing and uses of equalizers; the proper detection and correction of weaknesses; and particularly practical knowledge of all details of the system which managers should possess. The discussion was limited in time and comprehensiveness by the statement of Mr. Herrick, that a department of inspections intended to follow up the detail of all points of this character is now in process of organization, and will be made one of the features of the methods pursued by the new management.

FUEL GAS.

On the subject of some of the advantages obtainable by a system of Electric Light and Fuel Gas, Mr. John R. Markle, president of the Markle Engineering Company, of Detroit, read a very careful and suggestive paper, which was received with great interest by the association.

Mr. Markle's paper will doubtless be printed and circulated among the Edison Central Station people. An animated discussion immediately resulted and called out Messrs. Edgar, Field, Johnson Beggs, Gilbert, Mottram, Leonard and Insull, culminating in the appointment of a committee for the further investigation of the proposition, to report to the executive committee for such action as in their judgment might be deemed immediately advisable. This committee was composed of Messrs. Markle, Field and Edgar, with the president *ex officio*.

HIGH POTENTIALS AS AN ADJUNCT.

Mr. Gilbert, of Detroit, offered the following resolution:

Resolved, That the association respectfully call to the attention of the Edison General Electric Company the difficulties under which the local companies are now laboring in consequence of the lack of:

1. An efficient and inexpensive arc light system.
2. An arc lamp which can be economically operated on the three-wire system.
3. A flexible method of enlarging the territory which can be profitably covered from their stations for domestic lighting by higher pressures and consequently less outlay of copper than that involved by the three-wire method.

We earnestly appeal to the parent organization to supply these deficiencies.

In the discussion which followed it was brought out that this question had been carefully considered by the parent company, who had instructed Mr. Jenks to prepare a statement as to the various methods by which the Edison stations may be thus enlarged. A number of extracts from this paper are given below.

The address of Sir William Thomson, as president of the physical section of the British Association in 1882, contains this memorable passage: "Nothing above 200 volts on any account ever should be admitted into a ship or house or other place where safeguards cannot be made absolutely and for ever trustworthy against all possibility of accident." This opinion accords with what Mr. Edison has always maintained: that in the long run every system will fail which does not (for domestic service) use a low-pressure current.

Bearing in mind, therefore, this underlying idea as a text, the purpose of the few methods to be described will readily be understood. They are merely attachments or excrescences on the comprehensive plan represented by the three-wire system; makeshifts, having special uses or fields.

1. *The Double Three-wire.*—This system possesses the paramount advantage of using only one-fourth of the copper of the regular system. With this arrangement four or six lamps can be put on a two-wire service, and with a reasonable outlay of copper in mains the drop falls to almost nothing. The same meters can be used with simply a change in the constant. The extreme pressure brought into a building is 440 volts, which, with a direct current, is within the limits of entire safety to human life.

2. *The 500-Volt Three-Wire.*—The Capital Electric Light Motor and Gas Company, of Boise City, Idaho, reports under date of July 31 that the long-distance three-wire high-pressure system, started July 3, 1887, while it has worked satisfactorily so far as its elec rical action is concerned, is not a feasible method for domestic lighting.

The people have been enthusiastic as to the operation of their plant from the first, and they are now proposing to install two No. 12 dynamos, specially wound for 275 volts each, to replace the present machines, and changing the system so as to have two 110-volt lamps in series. In this way they expect to do residence lighting with 20 per cent. drop in the line.

This three-wire plan, using 500 volts on each side, is entirely practicable for store lighting at long distances.

3. *The Direct Current Transformer.*—In all previous cases we have simply used a specially wound dynamo to get the potential required. There are two varieties of these in prospect. In the one now operated we have a motor and dynamo combined in one, the armature being provided with two independent sets of coils, a commutator at each end and no pulley. The high-pressure current of 1,000 to 1,200 volts from a Municipal dynamo is received on one commutator, and the low-pressure current of 100 to 125 volts sent out from the other. The sizes proposed are:

No. 3	60 amp.
" 6	120 "
" 10	200 "
" 16	320 "
" 32	640 "

This machine is regulated from the primary generator. The system is now ready for adoption by any company needing its advantages.

4. *The Alternating Transformer.*—It is well known to the Central Station managers that the parent company secured, some time ago, the rights for a desirable alternating converter system. The fact that it has not yet been put out bears witness to the steadfastness with which they have adhered to the policy of refusing to place on the market anything that they could not fully commend to the public as in every way desirable and safe to handle. It is only where peculiar conditions, such as extraordinarily cheap power, can be found that customers will probably require such a system after considering the advantages and economy of the 440-volt three-wire and the direct current transformer method. The admissions of the warmest friends of the alternating systems, at the recent National Convention, of the terrible danger attending their use, as exemplified by the horrible tortures which have been undergone by innocent victims, and the selection by the State of this current (of the standard 1,000-volt potential) as an embodiment of the most deadly force known to science for the execution of criminals, all point to a very limited application of this form of apparatus. It is especially noteworthy that the dangers attending its use will shortly influence legislation, as a matter of protection to life and property. But the demand for an alternating system being recognized, it is now proposed to offer one of the most efficient type at its actual value, as being dangerous and inefficient at best, but procurable on demand.

We are only interested in noting the contrast between this and the previous system in the flexibility. As the alternating converter has no moving parts it requires no attention, and can be operated where power is cheap with an approach to economy in small units, under such restrictions as have already been and may in future be imposed.

5. *The Municipal for Streets, Depots, etc.*—Tunnels, halls, stores and streets have been successfully lighted by this system for some time. Now a new field, which has for a long time being talked of, shows itself in lighting the train-house of the Central Railroad of New Jersey, which is an immense structure, 500 feet long and 200 feet wide. There are 12 tracks and 6 platforms. Over each platform are 16 3-light clusters, which make a full circuit, starting at the dynamo building, 800 feet away, and ending at a common return for all circuits. Should anything happen to this return wire, a second is provided, which may be connected.

The advantage of this system in railroad lighting is its simplicity and small cost. Buildings of this kind are generally very high. Lamps are best supported by long iron pendants; the Municipal wires, being small, may also be installed at a very small cost.

6. *The Municipal with Individual Control.*—Apparatus has recently been devised and is now offered to the public by which simple switches, out of the reach of the consumer, may be operated by cords to cut in or out individual lamps on municipal interior circuits, a compensating resistance being introduced either at the lamp or the central station, as ordered. Small constant load motors, as, for example, ventilating fans, may thus be run very economically.

7. *Arc Lamps on Edison Circuits.*—Weeks and months of the time of many inventors have been spent in endeavoring to adapt the arc lamp to a circuit of constant pressure. The light emitted by any lamp using ordinary carbons depends primarily upon:

1. The energy expended.
2. The detail of construction as affecting proper radiation of the light produced.
3. The size of the carbons.

All the arc lamps in general use on Edison stations in the United States to-day are connected with a resistance coil or with incandescent lamps, so that about 65 volts out of 110 are wasted. Only clock feed lamps can be used successfully, even in this way. In Boston several "Simplex" and other styles are so operated. Aside from the waste of energy, there is in all these cases the item of a large rheostat and its attendant heat, and, to a certain extent, danger from fire. Harrisburg has some 40 or 50 such lamps, and it is probable that 500 might be counted throughout the country.

The advantages to be gained by such a lamp, could one be so made as to be economical in power consumed and attendance necessary, are several:

1. Saving of special station-room, engines, dynamos and circuits.
2. Substitution of low-pressure conductors (which can be run in moldings or connected within the walls of buildings) for the dangerous pressures and necessarily exposed wiring of series lines.
3. Safety and convenience in handling of lamps and trimming by the customer, where with a series circuit the experienced trimmer is a necessity.
4. Avoidance of the dislike of Edison customers for duplication of inside wiring where a few arc lamps are demanded.
5. Ability of the company to meter the current of arc lamps as well as incandescents, thus avoiding the presentation of both a meter and a contract bill.

It is not surprising that in view of these important considerations persistent efforts have been made to operate two lamps in series. Four foreign lamps which have come here with some promise of success have been carefully tested.

The advent of a successful parallel lamp would, of course, go far toward solving the question which has always confronted the Edison station manager—"How shall I meet the demand for larger lights, prevent the rise of rival interests which, if suffered to begin operations with an arc system, are absolutely certain to compete with me sooner or later in the incandescent field, and secure to my own company such profits as I see others making in supplying arc lamps?"

It is to be hoped that somebody will speedily present this successful parallel lamp, and whoever does this at a reasonable price will find a market for hundreds and probably thousands.

8. *Arc (Series) Systems.*—The field cannot be entirely covered by the first-mentioned method. It costs too much for copper to distribute energy for a general street lighting system at low pressure. There are also many stores outside the economical limit of a three-wire system which demand arc service. What should the station manager care what his customer does with the current furnished, whether he heats an Edison filament, or runs a sewing-machine motor, or burns a Brush or a Sperry or a Ball arc lamp, so long as he pays a profitable price for it?

Many of us believe that the Edison municipal system gives the best diffusion of light, and really the most valuable street service. But if the station manager cannot convince his city council of this, it is evidently only an unprofitable sentimentalism which will refuse to furnish what is demanded. Whether or not in the perfect social and commercial science of the coming millenium the arc lamp will have a place is less important for us to speculate than whether we can make some money out of it while it is in fashion. Its adoption by an Edison company often prevents or removes the vexatious friction, annoyance and loss of a division of the local business. At all events, while some of the local companies have been proclaiming that the arc light has no field, others have been selling it and making money.

It is a pleasure to be able to say that under the new plan the Edison General Electric Company will soon be prepared, in cases where a comprehensive series system is needed, either to furnish or to definitely recommend and indorse some efficient and economical arc system, and if desirable superintend its installation.

In the purchase of real estate and the erection of stations, the possibilities of this kind of business should never be overlooked.

Arc street circuits up to several miles in length can be attached to an Edison Municipal Dynamo.

Discussion on this subject culminated in the assurance by Mr. Herrick that an active interest had already been shown by the parent company in the general question, and that immediate steps tending to the production of all these systems, and enabling the Edison station manager or agent to supply on its merits any system demanded by the public, will soon be consummated.

GROUNDING THE NEUTRAL CONDUCTOR IN THREE-WIRE SYSTEMS.

This is a subject which has for the past year been considered of unusual importance, and has received the careful attention of the Standardizing Bureau of the Edison Light Company. General experience with electric light systems stimulates a certain amount of suspicion on the first presentation of this idea to practical men, but has in almost all cases resulted in satisfying all intelligent inquirers as to the feasibility and value of the method. Some two months ago, at a meeting of Bureau, an entire afternoon was given to the discussion of the subject, Mr. Kruesi, of the Edison Machine Works being present. After the reading of several letters from station managers, definite action was postponed until such time as written expressions could be received from all constructors and managers who had given the subject any careful consideration, with the idea of submitting the matter to Mr. Edison as the final authority. This definite action has been postponed up to the present in consequence of Mr. Edison's absence in Europe.

The advantages of the proposed method, which has received the endorsement of some of the leading insurance people, were clearly stated in a paper prepared and read by Mr. Philip Seubel, of the Edison Machine Works. This presentation called out an animated discussion in the course of which the floor was occupied by Messrs. Leonard, Edgar, Howell, Johnson and Wirt. A committee was appointed to give this important subject further immediate and careful investigation, with instructions to report to the chairman of the Executive Committee, leaving him to notify the members of the association of the results reached.

MUTUAL INSURANCE OF EDISON CENTRAL STATIONS.

At the session held at Nantasket, a year ago, a committee was appointed to investigate and report upon the feasibility of a plan for the combination of Edison central station companies for mutual insurance protection. This action was rendered desirable because of the unwarrantable discrimination against electric light station risks generally, resulting from the lack of information possessed by the active officials of insurance companies.

At the Kansas City meeting in February last the committee reported that the Edison stations from whom they had received replies to their request for co-operation in this respect did not represent a sufficient capitalization or a sufficient total risk to warrant the formation of a company exclusively for this purpose. They were given further time, with instructions to learn what arrangements could be made with existing mutual or stock companies. Their report presented at this session is given in full, with the exception of the individual correspondence referred to.

"The Committee on the Mutual Plan of Insurance of Central Stations respectfully submit the following report:

"We have conferred with representatives of the Prudential Fire Association, the Manhattan M. F. Insurance Company, both of New York, and the Mercantile M. F. I. Company, of Providence, R. I. It is worthy of note that the president of the last-named company is the gentleman who has since the Fall River fire (until within two months) strenuously refused to negotiate with the Edison companies of New England. He has, however, lately found that the stock companies making up the New England Insurance Exchange have, after careful investigation, been satisfied to solicit business of this kind on the basis of 75 per $100 for what is called a 'Standard' risk, carefully outlined in their schedule issued after consultation with your committee in April last, since the date of our last report. This schedule is appended as a part of this report.

"We have found by these repeated and painstaking interviews that some action on the part of this association is almost indispensable to any general or profitable connection with those insurance companies which cover the best mill risks in the most careful and painstaking manner, so far as intelligent and rigid inspection are concerned, at the actual cost or a close approximation to cost of legitimate management. This will be best illustrated by reading a letter from this president, speaking for the Associated Mill Mutuals of New England, the organization which, under the general oversight of that authority on these questions, Edward Atkinson, has attained a pre-eminent position as representing an ideal system.

"We have not pushed this matter with single companies, for the reason that it is here shown that some assurance of some sort of uniformity in the risks must be received before we can get the benefit of low mutual rates. We must get a sufficient number of illuminating companies to agree to transfer their policies to mutual companies, so that a minimum volume of business and corresponding premiums shall be assured them, and that these illuminating companies will take all reasonable pains to set their houses in order. This can only be properly done as the result of such a system of inspection as is now proposed by the parent company.

"We therefore recommend:

"1. That during this session as many central station officials as possible agree in writing to transfer certain portions of their insurance to mutual companies at one per cent., provided an inspector sent by the parent company to all stations can report that our stations are so far safe in their construction and operation that the combined risks thus placed shall not be imperiled by the extra hazard of any of the risks included.

"2. That the association earnestly requests the co-operation of the parent company in carrying out this plan, as being the only authority really capable at present of thus in a sense standing sponsor for the companies thus to be benefited, and as being jointly interested with the association in bringing about this increased economy, and above all, this increased safety to our stations and thus reliability to our income.

"3. That this subject, thus shown to be only partially exhausted, be placed in the hands of a proper committee of three members in or near New York. That this committee be intrusted with the responsibility of keeping the members of the association frequently and carefully informed of the progress of their investigation and of any change in insurance rates or opportunity to secure favorable arrangements with any companies, and that the expenses of the committee in these or any other directions which they may unitedly consider it wise to investigate, be paid, as heretofore, by the association.

Respectfully submitted, for the committee,

W. J. Jenks, Secretary."

The committee intrusted with this work, being larger than is now necessary to carry it to completion, was discharged, and the following (being members of the old committee) were appointed in accordance with the recommendation of the report: C. L. Edgar, Boston; Thomas P. Merritt, Reading, Pa.; W. J. Jenks, New York.

THE MOTOR QUESTION.

The motor department of central station business was taken up by Mr. Beggs with a recitation of his experience in New York. He referred pointedly to the injury done illuminating companies by the action of agents who simply aim to make a commission on sales without taking into account at all the disadvantages saddled upon stations which are obliged in furnishing current to meet many perplexities and even severe losses caused by the operation of motors thus disposed of. He dwelt especially on the fact, which he said was apparent to every station manager, that many of these agents are evidently acting at variance with the policy of the companies they represent, and that such short-sighted methods will consequently in the long run prove to the disadvantage of those companies which allow them to earn large commissions by indefinite and irresponsible assertions. He gave a general idea of the prices adopted by the New York and Harrisburg companies under varying conditions, emphasizing the impossibility of fixing any well-defined schedule of rates for particular classes of work. He was very careful to have it understood that, while he made contracts for the supply of electricity to motors operating under all circumstances, he also made it an invariable rule to check the current of each motor by an Edison chemical meter. The aggregate motor business in the three New York central stations was shown to be upwards of 500 horse power. Among the many novel applications of the current for the purpose of producing energy is the use of the motor for the blowing of church organs, the motor taking the place of a salaried man in the choir. A great saving is made to the church officials, and the experience of many churches has been most gratifying.

Mr. Edgar, of Boston, summarized the experience there is in this line by showing that at present 700 h. p. is being supplied to motors, an addition of 150 h. p. having been made since the first of June. As in the case of the New York Company, Mr. Edgar is very careful to check the contract system (wherever it is found necessary to adopt it) by the chemical meter.

STEREOPTICON ENTERTAINMENT.

On Tuesday evening a large number of invited guests, with the delegates and their ladies, assembled in the parlors of the hotel and were entertained by a stereopticon talk given by Mr. W. J. Jenks, embracing several features of interest to practical electricians and officers of the illuminating companies. Among them was a minute synopsis of the specifications and claims of the Edison fundamental patents, having particular reference to those now in litigation, and to the Sawyer-Man fibrous carbon patent. The matter of lightning protection to station buildings and overhead lines was carefully reviewed and illustrated, specific directions being outlined for the protection of the station itself, the numerous experiments upon several forms of arresters for three-

wire and municipal circuits being shown. The entertainment closed with a large number of historical slides illustrative of the earliest stages of Edison's laboratory work and the present manufacturing industries.

Philip Seubel, of the Machine Works, presented an interesting paper descriptive of a method devised by him for the location of grounds in underground tube systems.

IMPROVED CHEMICAL METER.

Statements made at the convention by Messrs. Jenks and Wirt, of the parent company, show that since the date of the last session the improvements which have been for more than a year in progress are now practically accomplished, and that drawings for the new pattern of the chemical meter are now in the hands of Bergmann & Co., who are prepared to receive orders.

Many of the details embodied in these changes have already been reported in print. The construction as well as the methods of operation of the meter have been greatly simplified, so that now it will register accurately for the current supplied to one lamp or to a thousand, according to the size installed, and the possible error is reduced to one-fourth its former value. This is combined with a very decided saving in the running expense of a meter department, and in the simplicity of the entire system. A revision of the "Book of Instructions" to meter men is now being made, and within a short time large numbers of the new form will be in operation in Brooklyn, New York City, Buenos Ayres, S. A., and many other points of almost as great importance. The cost of changing from the old to the new will not be large, and station managers will shortly be informed of the exact plans of the new parts which may be applied by them without the necessity of sending their meters to the factory.

As an instrument for measuring current delivered to electrical railways, the Edison meter has shown itself reliable and accurate.

INTERIOR ELECTRICAL CONDUITS.

Mr. E. H. Johnson gave an account of the system of equipping interiors with conductors now being exploited by the Interior Electrical Conduit Company, of which he is president. This is a method of placing non-conducting and non-inflammable tubes throughout a building, and installing conductors after the work of building construction has been completed. It was shown that the cost is less than that of any other method of doing concealed work, with many advantages in way of convenience, readiness of reinforcement and safety.

NEXT MEETING.

The executive committee recommended that the session of 1890 be held at Sault Ste. Marie, in Northern Michigan. After some debate it was decided that the vicinity of Minneapolis or St. Paul was preferable, and the exact location was left to the executive committee, who will notify the association in due time.

Including the evening stereopticon entertainment, the convention held six sessions, the final adjournment being made on Thursday, at 5:30 P. M.

We are indebted for the above excellent report to the committee appointed by the Association to prepare and revise all matter given out for publication in regard to its proceedings.

Special Correspondence.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
167-177 TIMES BUILDING, NEW YORK, August 19, 1889.

"Magnolia" and Motive Power.—One of the claims made for the "Magnolia" metal is that its use increases the motive power of machinery. That there is some justice in this is to be inferred from the fact that the majestic "City of Paris," which has "Magnolia" metal in her journals, is "breaking the records" in fine shape, eastward and westward, being a "five days'" boat. The office of the Magnolia Metal Company is 74 Cortlandt street.

The Economy Waste Oil Filter, manufactured by the Waste Oil Filter Company, of 322 Pearl street, is evidently finding its way into the favor of the electric light and power men. Vice-President Beggs, of the New York Edison Company, is using four of the large filters with "entire satisfaction," while "the saving effected during a year will pay for the filters several times over." The superintendent of the Julien Electric Traction Company is not less emphatic. Station managers and superintendents should certainly introduce such apparatus at once.

Mr. W. G. Halm, of the Perkins Lamp Company, was in the city on Aug. 15, and I had the pleasure of meeting him at the office of the New York Insulated Wire Company. Mr. Halm says that he will be ready in a couple of weeks to take orders for incandescent lamps in any quantity, as the capacity of the Perkins lamp factory will be increased to 3,000 lamps per day. Mr. Perkins has a number of fundamental patents on electric light switches and exhaust pumps for the manufacture of incandescent lamps, and it is said that the company will make a fight on these in the near future.

Atlantic City, N. J.—Upon August 11, the electric railway at Atlantic City, N. J., operated on the Sprague system, carried 42,600 passengers. Every car in operation was crowded with passengers, and the entire equipment of sixteen cars were in constant service. Each car, besides carrying its own load of passengers, drew one trail car, also loaded, and in some cases two trail cars were drawn. In spite of this demand upon the electric motors the cars made their usual speed of from 15 to 20 miles an hour, and ran without interruption or the loss of a single schedule trip. The regular schedule of one of the electric cars at Atlantic City includes 18 trips per day, or about 120 miles. This is the lowest schedule allowed for any car, and many make even more than this. Considering the loads which these cars are obliged to carry, and the fact that all the cars are kept in constant operation, a mileage of this kind is particularly significant, and one which shows the reliability of the apparatus. Since this line has been put in operation, about three months, the cars have made over 100,000 miles. During this time there has not been a single schedule trip lost by the electric cars in spite of the fact that all the cars have been in constant operation. This is a wonderful record.

Mr. Wm. Bracken, the president of the Julien Company, is feeling very well pleased at the progress made by the cars of his company, and is certainly deserving of more credit than is generally accorded to him for the manner in which he has advanced the interests of storage battery street car work in this country. It is only four years ago that, traveling in Europe, he accidentally saw the first Julien car in Brussels, and since that time he has brought the system to this country, has experimented and developed it, has made innumerable trials and tests under most difficult conditions, has built factories, made batteries, built motors and equipped stations, and now he has the satisfaction of seeing the car thoroughly indorsed by the Fourth Avenue Company, one of the most critical and conservative that is to be found anywhere. This work, enough in itself to occupy one's energies, has been carried on as a supplement to the development of the battery for train lighting purposes, so that storage battery lighting is further advanced than seemed possible a year or two ago. Any one who travels in the Fourth avenue storage cars will, I think, agree with me in saying that it is, without exception, the most comfortable and pleasant ride that one could get in this country. I have ridden on the cars frequently while out on business, and I have never failed while on the trip to hear expressions of pleasure and approval from the passengers, accompanied by the devout hope that some day or other, not too far distant, all the street railroads of the city may be similarly equipped. I think every electrician echoes the pious wish and prays for the days when the horse car will be no more.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
Room 8, Cook Building, cor. Franklin and Congress Sts.
BOSTON, Aug. 16, 1889.

Revere Beach and Winthrop & Shore Railroad is reported to have the intention of soon lighting its cars by electricity.

Lynn, Mass.—The new building of the Father Mathew Total Abstinence Society is lighted by electricity by the Lynn Gas and Electric Light Company.

The Schuyler Electric Company, of Middletown, Conn., were the lowest bidders for furnishing the Washington Navy Yard with an electric light plant.

Mystic Bridge, Mass., expects to be lit up soon by the electric light. The charter secured last year has been sold to outside parties, who will commence work forthwith.

Portsmouth, N. H.—John Post, Jr., & Co., of Boston, are installing in the electric light plant of the Portsmouth Gas Company a 300 h. p. coil heater, manufactured by the Wainwright Manufacturing Company of Massachusetts, of Boston.

The New England Weston Company have just completed a 100 incandescent light plant for the Saratoga Victory Manufacturing Company, at Schuylersville, N. Y., and are at present putting in a 200 incandescent light plant at East Arlington, Vt.

Lowell, Mass.—The electric road of the Lowell & Dracut Street Railroad Company was formally opened this week and proved very successful. The line is about five miles long, and extends from Lowell through Tyngsboro and Collinsville to the town of Dracut.

Somerville, Mass.—At a special meeting of the City Council, the Mayor was authorized to sign the contract for the increase of electric lighting, and permission was given to the Somerville Electric Light Company to commence the work of setting the necessary poles.

Mr. H. H. Corson, the energetic agent of the Thomson-Houston Electric Company, at Knoxville, Tenn., is at present in town. Mr. Corson reports electrical business very active in Tennessee, and that special interest is being taken in the remarkable progress of electric railways.

Cottage City, Conn., will soon have the privilege of an electric railroad, to connect Oak Bluff Landing with Lagoon Heights, via Circuit avenue and Kennebec. Mr. B. F. Goodnough, of Boston, will survey the road at once, and work will be commenced as soon as possible.

The Thomson European Electric Welding Company.—At a meeting of the shareholders held recently in Portland, Me., the company was authorized to increase its capital stock from $1,500,000 to $1,600,000. The directors have not as yet decided to issue the new stock.

Dr. J. W. Chisholm, who owns all the foreign interests of Prof. Elisha Gray's telautograph, was a caller at this office during the week. Dr. Chisholm reports that the telautograph is now a perfect instrument, and that he has already has a lively demand for rights in different countries.

The S. S. "Petrel" and "Vesuvius."—The Thomson-Houston Electric Company were the lowest bidders for installing in andescent electric light plants on board the "Petrel" at Norfolk, Va., and the "Vesuvius" at the New York navy yard, and will in all probability secure the contract.

Portsmouth, N. H.—The Portsmouth Electric Light Company are installing a Worthington duplex independent condenser for use in their plant. The condenser has been ordered from the house of Henry R. Worthington, 70 Kilby street, Boston, who are furnishing a large number of these condensers to various electric light companies.

The Municipal Signal Company have been awarded the contract for equipping Fall River with their Police Alarm and Intercommunication System. Sixty-five boxes will be supplied at present. This company is securing a strong foothold in the business of providing cities with a thoroughly efficient system of police signal apparatus.

Newport, R. I.—Trial trips have been successfully made of the electric cars on the new electric street railroad. Great interest was taken in the event, as Newport has never had a street railroad of any kind in the past, and the "residenters" are well pleased that their first experiment should embrace the latest improvements that electric science has brought forth.

Randolph, Mass.—Application has been made to the selectmen for permission to erect poles and string wires in the street and locate an electric light plant in the town, under the name of the Randolph and Holbrook Electric Light, Power and Gas Company. If the franchise be granted, it is proposed to have the plant in operation in six months, using the Thomson-Houston system.

Lynn, Mass.—At a meeting of the Lynn Committee on Street Lights a new contract to be presented at the next meeting was agreed upon. It is proposed to substitute 800 incandescent electric lights for the 625 gas and oil street lamps now in use. Seventeen new arc lamps will also be added. The incandescent lights will be furnished for $15 annually, and the arc lights for 40 cents a day.

Marlborough, Mass.—The Marr Construction Company will install a 600-light Westinghouse direct current incandescent plant in the factory of the Commonwealth Boot and Shoe Company. The dynamo will be of the latest type of direct-current machines, combining the best elements of all other direct-current machines of recent make, and the work will be of the highest excellence, porcelain cut-outs being used throughout.

South Norwalk, Conn.—The Standard Electric Time Company, of New Haven, are installing a large plant of the Warner system electric time. Two fine regulators are used for standard clocks, one of which will strike the fire-alarm daily at 12 o'clock. About seventy-five clocks or indicators will be put in to start with, and others will be added as fast as they can be furnished. Mr. Percy E. Ferris will be manager of the plant.

Roxbury District, Boston.—The Gas Commissioners have dismissed the appeal of the Roxbury Electric Light Company, from the decision of the Board of Aldermen last February, when they refused permission to erect wires for the purpose of carrying on business south of Chester Park. The Gas Commissioners have decided that the Boston Electric Light Company can do the required work, and have granted them permission accordingly.

Newport, R.I.—The members of the 400 resident in this fashionable "City by the Sea" have not yet been able to realize that an electric railroad should be permitted to desecrate the streets of their temporary home. Two bills have been filed in equity against the Newport street railway, asking for both temporary and permanent injunctions against the erection of poles and wires. Meanwhile the cars are running and are considered a boon by all those who deign to use them.

The Star Electric Company, Bridgeport, Conn., recently closed an order with the Meriden Electric Light Company for increasing their plant at Meriden, Conn., by 75 lights of the American system. This company has also taken the agency of the Maine Electric Company, of Portland, Me., for the sale of their incandescent dynamos in New England. The Maine Electric Company are making a specialty of dynamos from 10 to 150 lights, and turn out a good, reliable and cheap machine.

The Armington & Sims Company, Providence, R. I., have made arrangements with the Canadian Locomotive and Engine Company, Kingston, Ont., whereby they will have entire sales and exclusive rights to manufacture the Armington & Sims engines in Canada. The Canadian Company have been re-organized under the management of Dubs & Co., the celebrated firm of locomotive engineers in Glasgow, Scotland. M. W. Lorimer will be managing director, and F. J. Leigh, superintendent.

The Connecticut Motor Company, Hartford, have resolved to move their factory from Hartford to Southington, Conn., where they will continue to manufacture their well-known electric motors from ⅛ to 10 horse-power. The business of this company has been steadily increasing, and they are in hopes to extend even more largely in their new factory. It is reported that they will soon take up the manufacture of railway motors, and will push for railway electric business with all their wonted energy.

The New England Electrical Supply Company have just received a small Crocker & Wheeler motor of ⅛ horse power for driving fans. This motor has been approved by, and is being sold by, the Sprague Company as agents. It is possessed of many new features, the chief of which is that the shaft has a lateral motion, by which the armature is brought more or less into the field as speed or power is required. Messrs. Sawyer & Blake are delighted to explain the principle of this ingenious motion to all who care to call.

The Electric Gas Lighting Company are evidently doing a slashing business in Samson batteries. While in their office to-day, I saw several orders for about a thousand batteries come in, which seemed to attract no special attention from Col. Burnham, who presides calmly and philosophically over the fortunes of this company. My only surmise was that such orders were of daily occurrence, though it is hard for the uninitiated to know where the steady great demand comes from. The Samson battery is undoubtedly a great favorite both in the West and the East.

Amherst, Mass.—The Amherst Gas Company have decided not to buy out the electric light company, but instead have purchased a complete Westinghouse plant, which will be installed in the gas-works. The plant will consist of a 500-light incandescent alternating dynamo, and will be used for house and commercial lighting. The Marr Construction Company will do the construction work, and a portion of the 1,000-volt circuit will be placed under ground. The gas company have contracts for lighting several of the college buildings and club houses and will install 300 lights in one factory.

Complimentary Dinner to Professor Thomson and Mr. E. W. Rice.—A largely attended complimentary dinner, given by the Thomson Scientific Club, of Lynn, to Prof. Elihu Thomson and E. W. Rice, took place at Young's hotel last week. Vice-President Van Depoele presided. The other guests were Colonel Ransom, H. A. Royce and E. I. Garfield. Among the speakers were Professor Thomson, Mr. Rice, Colonel Ransom, O. K. Stuart and H. A. Royce. Letters of regret were read from H. A. Pevear and B. F. Spinney. Fifty-five members of the club were present.

The Russell Electric Manufacturing Company are continuing to do a large business in their mast-arm specialty, having received an order for 1,250 feet from the Marr Construction Company, the well-known electric light contractors. Mr. Drake, who has now the entire management of the business of the company, reports that the Russell mast-arms are growing in favor every day as a strong, serviceable, durable and, at the same time, graceful method of hanging lamps. The Narragansett Electric Light Company, of Providence, have recently used 3,600 feet of the Russell mast-arm in their city, and are well pleased with the result.

West End Railway Company.—At a special meeting of the stockholders of the West End Street Railway Company, the following motion was put and carried unanimously: "That the directors be and they are hereby authorized, to petition the board of railway commissioners for leave to increase the capital stock of the company beyond its present authorized capital stock by the amount of $4,500,000, divided into 90,000 shares of common stock, such increase being proposed to enable the company to pay for construction and increase of property, and in particular for expenses incurred and hereafter necessary to be in introducing and perfecting the electric system of motive power in the operation of the cars of the company, such new shares to be issued from time to time by the directors, as provided by law." I need not give the points from Mr. Whitney's address at the meeting, as you have already commented on them.

New Haven, Conn.—The New Haven Electric Company have just made a contract with Proctor & Gurner to put in 500 incandescent lights of 16 c. p. in their opera house in this city. The work of installation will be under the care of the company's electrician, Mr. Fred. Lewis, a sufficient guarantee that the work will be thoroughly well designed and carried out. The switchboard will be of the same type as the one in Bunnell's Theatre, which was also designed by Mr. Lewis three years ago, being very compact, complete and extremely flexible in its number of combinations. As in the Bunnell Theatre, no gas will be allowed in the building, entire confidence being placed in the electric light. That this confidence is not misplaced may be proved from the interesting fact that during the three years that the electric light has been in Bunnell's Theatre there has never been a single lamp out, nor even a fuse blown. Everything will be done to make the work thoroughly fire-proof, the switchboard being in slate and the very best of insulated wire used throughout. The New Haven Electric Company are using quite a number of the Perkins incandescent lamps, and are well pleased with the results shown, the lamps being reported to be extremely long lived.

Salem, Mass.—The new electric light station on Peabody street, of the Salem Electric Lighting Company was opened last week by an informal but very enjoyable reception given by the officers of the company. Neat cards of invitation were issued by Henry Batchelder, the treasurer of the company, and an excellent lunch was purveyed for the comfort of the guests during the evening. The designing and equipping of the station has been ably accomplished by Mr. Henry C. Patterson, of the Thomson-Houston Electric Company. There are at present installed in the building two McIntosh & Seymour engines of 350 h. p. each, and one engine of 160 h. p., manufactured by the Fitchburg Steam Engine Company. Space is reserved for two additional engines of 380 h. p. The shafting and friction clutches were furnished by the Mill Clutch Works, of Cleveland, O. The boiler house is 90 feet long and 50 feet wide, and is large enough for 10 boilers of 125 h. p. each. Four boilers 17 feet long by 72 inches diameter are in position at present, furnished with the Jarvis patent setting, and manufactured by the Cunningham iron works. They are the ordinary tubular type with steel tubes, and strongly braced to carry pressure of 125 pounds to the square inch. They are eleven arc light dyna-

mos of thirty lights each, and two incandescent dynamos of 400 lights each. It is proposed very soon to supersede the continuous incandescent dynamos by two alternating dynamos of 650 lights each, and to put in a special dynamo for furnishing power. This is one of the most complete plants in the country and the Salem Electric Light Company, as well as the engineers, are to be congratulated on the results of their labors. A. C. S.

WESTERN NOTES.

Branch Office of The Electrical World,
39 Mallers Building, Chicago, Aug. 17, 1889.

A. B. Lyman, Cleveland, has recently issued a little work of special interest to telegraphers.

The Brush Electric Company are putting an incandescent plant in the Louisville cotton mills.

The Postal Telegraph Company is engaged in stretching a second wire from Akron to Cleveland, Ohio.

Foree Bain, Chicago, is building a dynamo having a novel self-oiling box; also fifteen motors of 15 to 25 h. p. each.

The Miller Electric Company, Cleveland, O., have assigned all property to C. H. Atwater to protect the creditors.

The Lockwood Instrument Company, of Detroit, will shortly place on the market an improved polarity indicator and a new type of ammeter.

The Gaynor Electric Company is now wiring the building for the colored insane, at the Central Insane Asylum, at Anchorage, Ky., for 200 16-c. p. lights.

New Concerns.—The Consolidated Electric Company; Oxford Manufacturing Company, to do general manufacturing business, and the Chicago Machine and Power Company, have been formed at Chicago.

Mr. R. Coleman, of New York, who so ably represented the American Indurated Fibre Company's interests at the Electric Light Convention at Niagara Falls, visited Detroit this week to look up the underground question.

The Detroit Electric Tower Company.—The entry of final decree in the suit in equity brought in the United States Court against the cities of Ypsilanti and Bay City, Mich., has been postponed for sixty days from Aug. 2.

The Detroit Motor Company, of Detroit, are bringing out a new type of motor, designed for light work, in sizes of 1-16 h. p. and ⅛ h. p. The motor is shunt wound, has two field coils only, and has a double pole cut-out, of new design.

The United States Electric Lighting Company, of this city, have installed two alternating dynamos of 750 lights each, and are now running street mains to supply incandescent lights at a greater distance from their station than was possible before.

The National Carbon Company, Cleveland, are distributing the revised edition of their complete directory of arc electric light plants, corrected up to August. It is seldom that so much information is compiled in such a convenient form for gratuitous distribution.

Schlesinger, Kimball & Co., of Columbus, O., have closed a contract with the Sunday Creek Coal Company to equip one of their mines electrically. The plant is to consist of two locomotives, cutting machines and drills, and is to be operation in about two months.

Electric Club Notes.—The following visitors were entertained at the club rooms during the past week: Frank E. Fisher, Detroit; T. J. Olin, Piqua, Ohio; Henry Keller, Sioux Centre, Minn.; John S. Ray, New York City; James R. Dee, Houghton, Mich.; Frank Cooley, Cincinnati.

Phonographic Tests.—At the Minneapolis Saengerfest several phonographs were placed in position to record the production of Gilmore's "Anvil Chorus," with a view of testing the efficiency and capacity of the instruments for reproducing sound under varying circumstances.

The Superior Arc Light and Power Company, Superior Wis., has secured a twenty-year franchise and a five-year contract from the city for arc-lighting. F. R. Anson, formerly of Duluth, is the manager of the company, and is in the market for sixty arc lights and the necessary construction material.

B. E. Sunny, as chairman of the special committee working to secure the World's Fair for Chicago, will call a meeting of his committee at the rooms of the Chicago Electric Club on Monday evening next when the plan of working will be agreed upon. Mr. Sunny's comrades in this good work are Charles Wilson and E. M. Barton.

The Rockford, Illinois, Electric Manufacturing Company, of Rockford, has been incorporated for manufacturing and selling electrical and other machinery, apparatus and appliances and furnishing electricity for all purposes; capital stock, $50,000; incorporators, George A. Mayo, C. F. Warner, H. W. Price, and Peter Sames.

A. L. Ide & Son, of Springfield, Ill., have received a contract from the city of Chicago for furnishing and erecting engines, boilers and machinery complete for four electric light stations for lighting the streets. Sixteen Ideal engines of 125 horse-power each will be required. Buildings will be erected with room for doubling the capacity of each plant in the near future.

Fred. W. Horne, Chicago, Western manager of the Excelsior Electric Company, has just placed an additional hundred arc lights in the station of the Consolidated Electric Light Company, at Kansas City, making a total of 350 arcs placed thus far. Mr. Horne states that the factory is working night and day in the endeavor to supply the demand for the Excelsior motor.

J. B. Crouse, vice-president of the Standard Carbon Company, Cleveland, has personally taken orders for 6,289,250 electric light carbons since the February convention. During a three weeks' trip in July he secured orders for 1,687,000 carbons, which is doing well in summer time. The company is having two new furnaces built in order to meet the increased demand, and will shortly be able to turn out over two million carbons per month.

The Gate City Electric Company have opened their warerooms and offices at 522 Delaware street, Kansas City, Mo., and propose to do a general electrical business, and will carry the largest stock of supplies to be found West outside of Chicago. John W. Mason, formerly District Superintendent of the Michigan Telephone Company for the Adrian District, is the manager. There is no reason why a large supply house, carrying an ample stock of goods daily called for, should not succeed in Kansas City, and I wish them success.

The Detroit Electric Tower Company brought suit in the United States Court against the cities of Ypsilanti and Bay City, claiming that the electric light towers used by those two cities infringed upon the patent belonging to the Detroit company. July 25 Judge Brown held that the first patent claimed by the complainant was valid, and had been infringed by the defendants; the bill as to the second patent was refused. An injunction was refused, but the entire matter was referred to a master to ascertain damages, etc.

Telephone Quotations.—Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes quotations on telephone stocks as follows:

Chicago	$305@$310	Cumberland	$ 68@ $70
Central Union	58@ 59	Wisconsin	116@ 117
Michigan	84@ 85	Bell of Missouri	150@ 152
Great Southern	32@ 33	Iowa Union	24@ 25
Colorado	36@ 38	Missouri and Kansas	61@ 62
Rocky Mountain Bell	40@ 42		

Hugh G. Smiley, Chicago, has filed a bill for the dissolution of the partnership and an accounting against G. A. Harmount, Western agent of the New Haven Clock Company. Smiley claims Harmount has taken advantage of a clause in the copartnership agreement providing for its termination on six month's notice to freeze him out. On the other hand it is currently reported that Smiley has done much to injure the supply business in the West through cutting of prices.

More Electric Cars at Akron, O.—One of the most convincing arguments in favor of using electricity for the propulsion of street cars is the fact that nearly every railroad which has operated electric cars upon a reliable system, for some time, has ordered an additional number of cars. Among these railroads may be mentioned those at Wilkesbarre, Pa.; Wilmington, Del.; Richmond, Va.; Cleveland, O.; Reading, Pa.; Atlantic City, N. J.; St. Joseph, Mo., and a number of others. It is understood that the street railroad which has been in operation upon the Sprague system in Akron, O., for about six months, and has been carrying large numbers of passengers, has lately ordered twenty additional motors for the equipment of its road. This road, when put in operation, was equipped with the old style of Sprague railway motor, such as is used at Richmond, and a few of the roads which were first installed upon the Sprague system. These motors have worked so successfully that the Akron Company has decided to retain their use and equip additional cars with the same style of motor, which has proved to give such good service on their road.

The Fisher Electric Company, of Detroit, is a new addition to the electrical industries of the West. The company proposes to transact a general electrical business, dealing in supplies, contracting for the installation of arc and incandescent apparatus, manufacturing motors and a full line of house goods. The organizers and officers of the new company are as follows: President, Samuel R. Mumford; vice-president, C. H. Meday; secretary, Wm. E. Reilly; treasurer; Frank E. Fisher. The capital stock is $50,000. Of the gentlemen named Mr. Mumford is secretary and treasurer of the Michigan Savings Bank and also treasurer of the Edison Illuminating Company. He is one of the solid business men of Detroit. Mr. Meday is general superintendent of the Hammond & Standish Company, and is a shrewd and successful business man. Mr. Reilly is assistant cashier of the Merchants' & Manufacturers' Bank. Frank E. Fisher is well known as a talented electrician. His inventive ability and business capacity make him a valuable man. Hiram Marks, a thorough mechanic and electrician, has been secured as manager. The works of the concern will be located on Larned street west, between Second and Third streets, the company having leased the building 183, 185 and 187 Larned west. It has three stories and a basement, and is 90 × 100 in dimensions. Fisher has just returned from an eastern trip, and expects to be able to fill all orders within the next three weeks.

C. C. Warren has accepted the general management of the Leonard & Izard Company, Chicago, who have the general agency of the United Edison Manufacturing Company for the central States comprising Ohio, Indiana, Illinois, Kentucky, Michigan, Wisconsin, Minnesota, Iowa and Missouri. When it is remembered that Mr. Warren closed over four hundred contracts for separate installations of the United States system during his management of their Chicago office, the proper thing to do is to congratulate H. Ward Leonard on securing so strong a representative for the Edison interests. Mr. Warren will be aided by a staff corps of representatives long identified with the Edison Company, all of whom will report personally to the Chicago office, which is the general headquarters. The few assignments thus far made are as follows: Mr. Arthur H. Brown to the Cincinnati district; R. H. Pierce to Wisconsin; M. T. Fairclough to Northern Ohio and Indiana; Mr. Geo. Fisher to Northern Illinois; A. H. Reece, continuing at St. Louis. The remaining territory will shortly be assigned to the same class of able representatives. Mr. W. S. Andrews, who is one of the members of the Leonard & Izard Company, will superintend all the construction work, which simple announcement is ample guarantee that every installation made will be perfect in all its details. Both Mr. Andrews, who has spent most of the year in Minneapolis superintending the construction of the Edison central station there, and Mr. Warren, who has lately made several successful trips to the Pacific as well as the Atlantic, will be gladly welcomed back to Chicago by all the electrical fraternity.

The Hill Clutch Works.—Standing well up on the lake shore near the western outskirts of Cleveland are a series of buildings that skilled workmen are eager to labor in, because there is an utter absence of dingy smoke, and the rooms are light and cool and airy in summer and warm and comfortable in winter; because every inducement is held out to a good man to remain permanently with the company, the wages allowed being a trifle above the usual rate and promptly paid each week, and because the treatment accorded the men is at all times firm but just and honest. What is the result? Changes in the working force seldom occur except in the line of promotion as additions are made, for the men are happy, contented and cheerful, while the work turned out is of the highest order of excellence, and has gained for its makers a national reputation, the Hill clutch pulley being well known throughout the world. The castings when fresh from the foundry are so smooth in finish as to be susceptible of a high polish, and are quickly put in condition, when every piece of work, whether coupling or pulley on line shafting, is regularly set up in the same relative position it will eventually occupy, and thoroughly tested and each part made interchangeable, and any part found running untrue changed or substituted before leaving the premises. To aid in rapidly reducing a pulley or other piece of work to mathematical correctness, thousands of dollars have been invested in machinery and tools, many of which were designed by Mr. H. W. Hill, the cost of two machines alone, one of which will polish a 72-inch pulley, exceeding $9,000, while the cost of mandrels for every size of bore, and of other fine measuring instruments, has run the total investment up to many times the amount named. Although the Works have been in constant operation for 23½ hours out of the 24 during the six days in every week throughout the last three years, little or no stock has been on hand, the numerous orders received having kept the entire force engaged on special orders for complete equipment designed by Mr. Hill, the largest stations in the country containing his pulleys and clutch couplings. Secretary Irwin looks after the correspondence and office, and the superintendent, O. F. Pillings, kindly watches out for the interests of employer and employés, while the general prosperity everywhere apparent is but another indication of the wonderful activity in the allied industries of electrical enterprises.

Cleveland, Ohio, Street Railways.—The street car presidents of the city held another important conference Saturday morning, in the office of M. A. Hanna, on the sixth floor of the Perry-Payne block. Those in attendance were M. A. Hanna, of the Woodland Avenue and West Side road; Tom L. Johnson, of the Brooklyn Line; Frank De H. Robinson, of the Superior street road; A. L. Johnson, of the South Side line; Joseph Stanley, of the Broadway road; John Koch, vice-president of the Superior street road; George Tulhern, superintendent of the West Side line; Samuel Andrews and A. Everett, of the East Cleveland road; Charles Hathaway, of the Superior line; Colonel Herrick, Colonel Pain, the engineer, and a number of stockholders of the different street railways. Mr. Hanna presided. In discussing the question of electrical power for railways, Mr. Hanna said that he had abandoned his idea of making an experiment with storage battery cars, as he did not consider them a success. He further said that he had not ordered any storage battery cars, and would probably put in the overhead system. The Brooklyn, South Side, West Side and Broadway lines were practically in favor of a central power house, but the East Cleveland was not ready to express an opinion. Mr. Johnson first favored a central power house big enough for all, located in the flats near the river and near the railway, first to use condensing engines, and secondly, to get coal cheaply. Such a station would cost $200,000 made large enough to accommodate a reasonable growth during the next two years. The companies favored this, and were about to adopt it, when it suddenly struck Mr. Johnson that it was bad policy to risk all the motor power in one house, and he suggested that two central power houses be built, one on the east side and the other on the west side of the river, so that in case of a fire or other mishap the travel in the central portion of the city would not be delayed. This caused a split, and no action was taken upon the power house. The talk then turned upon the wires. It was decided that four trolley wires would be needed on Superior street, one over each of the four tracks. Mr. Johnson's idea was to have a feed wire strung up Seneca street from the central power house, another at Water street and a third at the Connotton Valley depot. This would keep the trolley wires constantly supplied. He also advocated switches, so that in case one company's trolley wire gave out the car could be transferred to another. Samuel Andrews was of the opinion that each company should put up and control its own wires. Dr. Everett, of the East Cleveland road, arose for information, and wanted to know how close the wires could be strung without interfering with each other. One of the electrical engineers said that one inch would be enough, but it was better to have them farther apart, as heavy wind was liable to bring the wires in contact. If this should occur the weaker wire would be burned out. F. De L.

Louisville, Ky., August 7, 1889.

The Thomson-Houston Company have installed another plant at the mills of the Henderson Woollen Company in Henderson, Ky. The Thomson-Houston Company have been exceedingly busy here lately, putting in no less than six plants, making a total of 1,400 16-c. p. lamps.

The Ohio Valley Telephone Company rendered excellent service in transmitting bulletins from the jail of the recent double hanging, to the *Times* office. The transmission was perfect, and to this is, in a very large degree, due the fact that the 6:30 extra contained a complete description in brief of the terrible scenes enacted on the scaffold at 6:10.

The Louisville, Ky., Board of Aldermen have sent a committee to Chicago to inspect the city fire alarm and police telegraph systems. In the party is the chief of the fire department Maj. Ed. Hughes. The committee is composed of Ald. Albert A. Stoll, J. J. Creamer, and J. C. Gilbert; Councilmen S. Hartfield, Col. John Hancock, A. Chickering, and J. R. Pflanz.

English, Morse & Co., of Kansas City, report business good in their various lines. They are making a specialty of complete steam plants for all kinds of service, furnishing Corliss or high-speed engines, also boilers to suit special service. They also carry a very full stock of supplies, including steam pumps, heaters, belting, Dodge wood pulleys, brass goods, etc., etc., also a full line of ventilating apparatus, including Sturtevant fans with or without power; also a full line of Lidgerwood hoisting engines.

ENGLISH NOTES.

[*From Our Own Correspondent.*]

London, July 3, 1889.

Woodhouse & Rawson United.—Following in the wake of the several electrical companies who have lately been combining their forces, Messrs. Woodhouse & Rawson have just united the several branches of their firm under one management, to be called in future the "Woodhouse & Rawson United." The firm was one of the earliest in the field of electrical engineering, but some few years ago was split up into several companies representing the interests of the respective partners. They have prospered fairly well, but have become convinced they will do better by coming together again. The amalgamation includes the firm of Messrs. Charles L. Baker, of Manchester, the gentleman bearing that name taking charge of the manufacturing department. The undertaking appears to be starting on a sound financial basis, and promises well for the interests of the new shareholders.

The Paris Exhibition Awards.—The methods pursued at the Paris exhibition for awarding prizes to electrical exhibits has awakened some disapproval even in France. A series of exhaustive tests, which was at first contemplated, has given way to mere perambulating inspection, and the result is satisfactory to nobody, not even to the winners, who can make but small capital, one would think, out of a victory so easily and fortuitously won. In England the affair has provoked so much dissatisfaction that we hear of suggestions that at all future exhibitions, so far as electrical machinery and appliances are concerned, there shall be no prizes, but only certificates of efficiency. It is argued that tests, however conscientiously carried out on such occasions, can afford no trustworthy evidence of the commercial value of the thing tested; but that they might be serviceable as satisfying a certain high standard of electrical excellence. The question is a complicated one, and the solution is not easy to find; but certainly the method pursued at the Paris exhibition ought to be rigidly avoided elsewhere.

Electrical Distribution by Means of Condensers.—In a short and interesting article in a recent number of the *Electrician*, Dr. Stephan Doubrava, of Brünn, gives some account of a method devised by him for the purpose of utilizing condensers in high tension distribution. His idea is to employ a continuous current dynamo in connection with a peculiar form of commutator, which he calls a "disjunctor," and by means of which the current in the supply circuit is converted into an intermittent alternating current. Across the mains he connects his condensers in parallel, and in each

condenser circuit he places a transformer. The "disjunctor" may be either placed close to the dynamo at the station or in substations, and the lamps are connected to the terminals of the transformer secondaries in the ordinary manner. The sparking at the "disjunctor" has been got over in a simple and effective manner by merely causing the commutator to synchronize with the natural period of the condenser when charged under constant E. M. F., so that at the moment when the dynamo terminals are disconnected from those of the condenser, there is no difference of potential and consequently no possibility of sparking. Ingenious as Dr. Doubrava's system is, it is difficult to see its practical advantages, and the mathematical theory of the method is likely to remain its chief claim to notice.

The Edison-Swan Company.—The sixth annual meeting of the Edison-Swan Company yesterday was naturally of a very jubilant character. A seven per cent. dividend is a welcome windfall at any time, and the fact that it had been long in coming only tended to give it a more appreciative reception. The satisfactory termination of the lamp litigation with that doughty opponent the Anglo-American Brush Corporation, the reduction of management expenses by seventy per cent., and the transformation of the £29,000 loss of 1884 into the £48,000 net profit of 1889, all contributed to make the board and the shareholders mutually congratulatory. As I mentioned in a recent letter, the Brush Company have decided not to appeal to the House of Lords, and have entered into an agreement with the Edison-Swan Company by which they bind themselves not to manufacture incandescent lamps within the United Kingdom and to pay the taxed costs of the recent litigation. The Edison-Swan Company, on the other hand, have agreed to take a license of all the lamp patents held by the Brush Company, and to pay a royalty of one farthing per lamp, the royalties in one year never to exceed £375. Perhaps the only person not to be congratulated in this connection is Mr. Edison, whose B shares in the Edison-Swan Company, amounting to about one quarter of the total share capital of the company, do not receive any dividend whatsoever and will not do so until the A shares have received the full amount of 7 per cent. cumulative dividend from the commencement of the company.

The Electrical Purification of Sewage.—The success of Mr. William Webster's electrical process for purifying sewage has led to its experimental adoption at Maidstone, where great pressure has been brought to bear upon the local authority to induce it to discharge the town sewage in a more innocuous condition into the river Medway. Mr. Webster's works at Crossness are still in active operation, and since there is every probability of the whole question of the treatment of the London sewage being once more reopened, the good work done at Crossness for the past twelve months will certainly result in the electrical treatment of sewage being seriously considered by the experts who will be appointed by the London County Council to tackle the problem. M. Hermite, of electric bleaching fame, is also carrying out some experiments on a large scale at Rouen, with a view of introducing an electrical process of his own. The chief agent in the Hermite process is common sea salt, and the method is therefore peculiarly adapted to seaside towns, where, however, the purification of sewage is not of pressing importance. In inland towns the necessary quantity of salt has to be placed in the "electrolyzers" from time to time, and, as according to M. Hermite's estimate, from 70 to 350 grains of it will be required per gallon of sewage, the process appears to compare unfavorably, from the point of view of cost, with that of Mr. Webster's, in which only two grains of iron are used per gallon.

Electric Lighting Activity in the Provinces.—The rush for provisional orders still continues, or rather I should say the full dimensions of the rush are now becoming visible, since the notices of the electric lighting companies were all served upon the various local authorities some three or four weeks ago, and are now only coming to light, owing to the fact of their being considered by the committees appointed to take the matter in hand. Up to the present I have noted, exclusive of several applications for metropolitan areas, no less than 170 notices of intention to apply for parliamentary powers, which have been served upon nearly 90 local bodies. In the majority of cases the authorities have been content to formally acknowledge the receipt of the notices, and to await events, although in a few instances determined opposition has been proclaimed. Several towns have been stirred to the point of considering the question of municipal electric lighting stations. The provincial governing bodies are now confounded by the same difficulty which caused the London vestries about this time last year to adopt such widely divergent views on the question. The rate-payers are not likely to support any large expenditure, and what has in this country hitherto been a somewhat unremunerative enterprise; and on the other hand, unless these municipal stations *are* established, the local authorities must expect to see the business in the hands of private companies, which will not be at all to their liking. The ultimate result will, however, no doubt be much the same as in London, that is to say, the companies will be allowed to proceed to work under strict supervision.

Electrical Communication with Light Vessels.—The second and final report of the committee appointed in 1887 by the Board of Trade to inquire into the desirability of maintaining electrical communication between light-ships or outlying light-houses and the shore, has just been issued; and I regret to say it is adverse to that proposal. The evidence on which the report is based has not been made public; and we can only account for the decision by the restricted nature of the references to which the inquiry was confined. These were chiefly whether the experiment at the sunk light-ship which began about five years ago would warrant the expenditure for establishing similar electrical communication with other light stations round the coast. The period intervening has been exceptionally free from serious fogs and storms, and comparitively few occasions have arisen on which the telephone line has been used for life saving purposes. The Chairman of the Royal National Life Boat Institution, who was one of the committee, and who dissents from the main conclusion of its report, expresses the opinion that the telephone service has rendered valuable aid whenever called into use, and that its discontinuance, as recommended by the committee, is to be deprecated. However, as a mere question of profit and loss, probably the inquiry could have arrived at no other conclusion under the actual circumstances, and we can only look forward to extended experiments, carried out by private enterprise or public benevolence, leading to a different result. On one point the report is highly satisfactory and encouraging, namely, as to the practicability of establishing and maintaining electrical communication with positions like that of the "Sunk" light ship. The conditions of tides and currents, as well as the foul and rocky bottom, are most unfavorable to the connecting cable, but it has stood the test far better than was expected, the interruptions being comparatively few and promptly repaired. Latterly these interruptions have been due to the cable getting worn out, the fouling of the ship's moorings as she changes her position with the tides—a frequent cause of accident at first—having been rendered far less frequent by the adoption of improved swivel arrangements for connecting the cable with the vessel.

The Metropolitan Electric Lighting Schemes.—The parliamentary select committee to which the various metropolitan electric lighting schemes have been referred, held four sittings last week, and practically disposed of all the contentious matter relating to the bills. The modifications agreed upon in the select committee will, probably, meet with no opposition when presented to Parliament, and it is expected that the bills will receive the parliamentary ratification in the course of the next fornight or three weeks. These being the first serious attempts at legislation in respect to practical projects for giving the electric light a legal footing in the metropolis, there was a great array of counsel representing the several interests and local authorities who fancied themselves concerned with the matter. The newly created London County Council was, of course, prominently in evidence, asserting its right to be consulted at every turn, and to be placed on a level with the Board of Trade as regards all points reserved for the discretion of that body in administering the act. The vestries, on the other hand, were extremely sensitive about their more ancient rights, which they were unwilling to part with either to the companies or to the County Council. The companies themselves were of course strongly represented by some of the foremost technical counsel of the day; and lastly, the gas companies claimed to have their say on any points where their existing service, or their rights over prospective operations are at all likely to be jeopardized by the underground works of the electric lighting undertakers. On the whole, however, the interposition of the gas companies was moderate and free from any marked hostility, their attitude being that of a confident man in possession who fears no rival, and can afford to be magnanimous. In the end it was agreed to insert a clause in the bills providing for reciprocity between the gas companies and the electric companies in digging trenches, fourteen days' notice being given by either parties to the other of what they propose to do. A good deal of discussion occurred on the question of combination among the companies, and, perhaps, warned by what has taken place, owing to the obscure wording of the Telephone Company's license from the post office, the several electric companies are required to obtain the sanction of Parliament before they can acquire the undertaking of or associate themselves with any other electric company. In this way a monopoly, by means of amalgamation, is sought to be prevented. The companies raised no formidable objections to this condition, arguing, probably, that if in the course of time amalgamation were desired by them it would also be desired by the public on grounds of general convenience, and would be readily conceded. Some stringent rules in respect to the companies' accounts have been laid down, one of which is, that they will have to be audited by the Board of Trade. The gas companies have to submit to this ordeal, and it is one of the necessary conditions attending the carrying on of any trade under statutory authority.

PARIS NOTES.

(From Our Own Correspondent.)

PARIS, France, July 22, 1889.

Mr. Frank J. Sprague and family have arrived in Paris after a few weeks spent in London, and are staying at the Hotel Continental. Mr. Sprague is combining business with pleasure, and is now busily engaged placing an exhibit of one of his latest motor trucks, with the water proof motors and other apparatus, in the railway section. It will soon be in running order.

The Messrs. Grompton & Co., of London, who have a very pretty exhibit in the British Section of Machinery Hall, do the entire arc lighting over the English, American, and portion of the French spaces in this building. They have been a little unfortunate of late, burning out one of the machines twice, and leaving the sections mentioned to shift for themselves as regards lighting. The United States section has been brilliant, nevertheless, for the Edison, Thomson-Houston, Sperry, and Heisler companies all have their spaces and some of their neighbors well lit, and the surrounding comparative darkness was just what was needed to show them off to great advantage.

The Sperry Exhibit, on the aisle next the British section, does not perhaps cover very much space, but there is sufficient in which to demonstrate the beauties of the system. The handsome, nicely-running arc lights, the peculiar construction of the dynamo, and its ingenious automatic regulator, attract much attention from the scores of electricians who come wandering about in search of novelties and information. Mr. Kingwell, the genial representative of the Sperry Company here, has his hands full explaining the features of his exhibit, among which is the electric mining machine described in a recent number of THE ELECTRICAL WORLD, and which is running here beautifully.

The Snelgrove Weighing Machine.—There is a small piece of apparatus in the British section which, while quite unobtrusive, is still of considerable interest to the many people who see it every day. This is a novel electric weighing machine, the invention of Mr. William Snelgrove, engineer of W. & T. Avery, makers of automatic weighing apparatus, of Birmingham, England. It is a popular little machine, as it weighs people free, to their great gratification. Many attempts have been made to devise accurate self-indicating scales, but I believe without success until Mr. Snelgrove produced his invention. It retains the old lever principle of action, but the balancing is entirely automatic. Upon the load being placed on the platform, the steelyard rises, closing a circuit through a battery, a small electro-motor and a magnet working a gear-clutch. This latter gears on a small poise on wheels which is driven along the steelyard by the motor until (if the load is not yet balanced) it strikes a spring switch at the end, opening the small gear-clutch and throwing in another, which sends along a larger poise in the same manner as the first. If, during this outward travel, the load is overbalanced, the steelyard lowers and the circuits are broken. The poises are held in position by a ratchet under pressure of a coiled-up spring, and if the yard just balances, the dials, which are geared to the poises, will indicate the exact weight. However, should the load be overbalanced, which is usually the case, the end of the balance makes a second contact below instead of on top, sending current through a magnet which lifts the pawl on the small poise and sends it running back until the correct balance is arrived at, when the dials will show at a glance the result. It is a very neat little machine, and can be made to weigh to any limit. In the machines on exhibition here, the limit is 20,000 kilogrammes and will measure in steps of 2 kilos.

The French Society of Physics held their regular monthly meeting in the American Industrial Section of the Exposition on Friday evening last, seats being arranged in the broad aisle for about one hundred and fifty. These seats were facing the personal exhibit of Prof. Elihu Thomson, an interesting lecture on some of his latest investigations into magnetic induction being presented by Prof. Abdank to an audience of some three hundred persons, members of the society and invited guests. Prof. Abdank, with the assistance of Mr. Parsons, of the Thomson-Houston Electric Company, tried several experiments in illustration of his remarks, which were received by his hearers with great satisfaction. These experiments have been described in the columns of the WORLD. Among them is the one with the small incandescent lamp (whose terminals were connected to a secondary coil of wire wound about it in the shape of a ring) immersed in a glass jar of water, and stood on top of a large electro-magnet receiving current at 104 volts from an alternating current circuit brought from Machinery Hall. When the circuit was completed through the magnet, the copper ring and lamp were repulsed from the pole, and upon reaching a certain portion of the magnetic field the lamp lit up—in the water as it was—creating quite a commotion among the on-lookers. This was explained to be due to the Foucault currents induced in the ring of spirally wound wire by the alternating current passing through the magnet spool. In other experiments with copper rings and balls, the induced currents heated the metal so hot as to be unbearable to the hand, and several experimentalists who tried to pick up the copper ball had their fingers scorched. After Mr. Abdank's lecture, which was very well received, the meeting adjourned to examine the Edison phonograph in its special Temple near by, and all were astonished to hear the ease and facility with which the instrument could talk a dozen languages, whistle, sing, play piano or brass band music, or reproduce a child's hungry cry. After the phonograph had been admired and wondered at, the party went in a body to Machinery Hall, where the Thomson electric welder was shown them in operation.

E. W. H.

THE TELEGRAPH.

Government Telegraph Rates.—The Wanamaker-Green discussion of the new one mill rate is still going on, and at the request of the Postmaster-General the Secretary of War has directed the Quartermaster-General to instruct his subordinates to pay no more government telegraph bills until the rates to be paid are furnished by the Postmaster-General.

The Telegraphic Rate Troubles.—The unsettled condition of affairs between the telegraph companies and the government has given rise to some complications. It frequently happens that secret service, lighthouse and other goverment employés desire to send telegrams when away from Washington, and for this service they are now required to pay the full commercial rate. As the use of the telegraph wire is imperative, these persons have paid for the messages in the hope that the government would reimburse them. As a result of several conferences between Assistant Secretary Batcheller and Assistant Postmaster-General Clarkson, it has been decided to allow a rate of one cent per word to be charged on these messages until a definite and final rate is agreed upon. This agreement does not apply to telegrams sent from the departments in Washington, as the amount is simply credited on the books.

THE TELEPHONE.

Chicago and Milwaukee.—A dispatch from Chicago of Aug. 17 states that the American (long distance) Telephone and Telegraph Company opened its lines formally between Chicago and Milwaukee on that day.

The Glasgow District Telephone Directory for 1889-90 has just reached us from Scotland, handsomely bound in leather and gilt stamped. It is issued by the National Telephone Company. The district engineer is Mr. D. Sinclair, and the district secretary, Mr. D. J. Smith. The book is beautifully printed on heavy paper and contains an excellent map of the telephone system operated around Glasgow.

THE ELECTRIC LIGHT.

Vandalia, Ill., is to go in for electric lighting. Mr. Rode is mayor.

Fort Worth, Tex.—The city will probably put in a plant of its own.

The New Cruiser "Baltimore" is to have another Edison dynamo.

Ottawa, Kan.—Mr. C. T. Ewing, of the water-works, is to put in an electric light plant there.

Bogue Chitto, Miss.—The Keystone Lumber and Improvement Company wants to put in a plant.

Dixfield, Me.—The Dixfield Electric Light Company is putting in a Heisler incandescent plant of 600 lamps.

Bellaire, W. Va.—The Bellaire Electric Company is putting in a Thomson-Houston plant and Ball engine.

Mauch Chunk, Pa.—The Heat, Power and Electric Light Company is putting in a Westinghouse plant.

Merida, Yucatan.—It is reported that D. Miguel and A. B. Smith will put in a large Brush plant, to cost $300,000.

Havana, Ill.—The Havana Electric Light, Heat and Power Company has been formed by V. P. Turner, O. B. Thorp and N. C. King, with a capital stock of $15,000.

New Bedford, Mass.—The Edison Electric Lighting Company of New Bedford, having failed to consolidate with the gas company, will proceed at once to enlarge its plant.

Skaneateles, N. Y.—The Central New York Electric Light & Power Company has been formed by A. Van Vleck, R. B. Wheeler and G. Barrow, with a capital stock of $100,000.

Los Angeles, Cal.—The Rhodes & Keese Electric Company have closed a contract with the Redondo Beach Company to equip their hotel with a Thomson-Houston plant of 12 arcs and 670 incandescents, and a 200-drop return call annunciator.

Waterhouse Arc Lights.—The Westinghouse Company have received orders during July for the following Waterhouse arc plants: Little Falls, Minn., 35 lights; Colfax, W. T., 35 lights; McKeesport, Pa., 35 lights; Bay City, Mich., 70 lights; Petaluma, Cal., 35 lights; Mauch Chunk, Pa., 50 lights; Sumter, S. C., 35 lights; total, 295 lights.

The Fort Wayne Electric Company.—A special dispatch from Fort Wayne, of Aug. 7, says: To-day the Fort Wayne Electric Company, with a capital of $3,000,000, was organized for the purpose of manufacturing electric appliances. The gentlemen at the head of it were formerly connected with the Fort Wayne Jenney Electric Light Company before they sold the plant to a Boston syndicate.

For the Washington Navy Yard.—Judge Advocate General Remy, U. S. N., upon the recommendation of Commander Bradford, has awarded the contract for equipping the Washington Navy Yard with an electric light plant to the Brush Electric Light Company, of Cleveland, at its bid of $13,975. The bid of the Schuyler Electric Company, of Middletown, Conn., was $13,750, but the engines it proposed to furnish were deemed inferior to those proposed by the Brush Company.

Lighting in Washington.—A dispatch from Washington of Aug. 14 says: "The Commissioners of the District of Columbia signed this afternoon a contract with the Electric Light, Heat and Power Company, of Washington, operating under the Westing-

house Electric Company, of Pittsburgh, to light certain streets with incandescent lights. This was done in spite of the opposition of the Washington Gas Light Company and the United States Electric Light Company, which claim a monopoly of street lighting for the district. All three companies will probably appeal to Congress."

The Westinghouse Electric Company report the following orders during July for central station alternating apparatus: Johnstown, N. Y., 500 lights; St. Joseph, Mo., 750 increase; Media, Pa., 1,000; Charlotte, Mich., 750; Cooper's Station, W. Va., 750; Arkansas City, Kan., 750; Point Pleasant, W. Va., 500; Dennison, O., 500; Mauch Chunk, Pa., 1,500; New York, N. Y., 12,000 increase; Pittsburgh, Pa., east end, 3,000; Wilmington, Del., 750; Little Falls, Minn., 500; Moscow, Idaho, 500; New London, Conn., 750 increase; Clearfield, Pa., 500; Penn Yan, N. Y., 750; Sherman, Tex., 750; Downington, Pa., 500 increase; Aurora, Ill., 100 increase, due to exchange; Dubois, Pa., 1,000; Sumter, S. C., 500; making a total of 28,600 lights.

The Heisler Electric Light Company have been awarded the contract for furnishing five hundred 30 c. p. lights to the St. Louis Exposition and Music Hall Association for use during the Exposition season this fall. The Heisler Company are furnishing a complete set of apparatus for this display in the Universal Electrical Exhibition. This plant, in addition to supplying the exposition with the lights above referred to, will have a sufficient surplus to fully illustrate the adaptability of the Heisler system for distributing incandescent lights from central stations over wide areas. The Heisler people report the successful starting of central station plants at San Marcos, Tex., and Marseilles, Ill. The principal lighting done by the latter company is in Ottawa, Ill., 8¼ miles distant, one of the circuits being 34 miles long.

APPLICATIONS OF POWER.

Dover, N. H., will have an electric road of the Thomson-Houston system put in by Mr. E. P. Shaw.

Hamilton, O.—The Hamilton Electric Street Railway Company has been formed. Mr. E. Potter is the president. The Hamilton & Lindenwald Electric Transit Company has been formed by D. D. Milliken, P. Benninghofer and others.

Saratoga, N. Y.—The Saratoga Electric Railway Company, of New York, has been incorporated with a capital of $50,000. W. B. Ferguson, of Boston, Mass., and J. M. Burt, of Bennington, Vt., are directors. The road will be two and one-half miles long.

The Weems Railway.—A dispatch from Baltimore, of August 7, says: On a two-mile circular track the startling speed of two miles a minute was this morning maintained for about ten miles by the three-ton motor of the Electro Automatic Transit Company, of Baltimore City, at the grounds at Laurel, Md. This speed equals three miles per minute on a straight track. David G. Weems, the inventor, conducted the experiments. The company will build at once a five-mile circular track on Long Island to demonstrate the practicability of the electric passenger system, and also the automatic system which was tried to-day, and is intended only for light express packages, mail matter and newspapers.

Good Record at Atlantic City.—It is reported that the electric cars at Atlantic City, N. J., are very crowded now with passengers, and that the electric railway is growing in popularity every day, on account of the speed which the cars attain and the reliability of the service which they give. The cars now in operation at this place make 18 complete trips daily over the entire road, or nearly 120 miles per day per car. This, considering the fact that each car draws a tow car, and that both motor car and the tow car are often overcrowded as only excursion cars can be, is a wonderful record, and it is open to doubt if it has ever been equaled under the same circumstance in any other part of the country. The cars at this place are in constant service, the operating company, the Pennsylvania Railway Company, keeping no reserved cars, so great is their confidence in the reliability of the apparatus. The Pennsylvania Company have ordered an additional number of cars, and their officers speak very highly of the operation of this street railway.

The Short Electric Railway Company.—A new departure has just been taken by the Brush Electric Company, of Cleveland. It has become the largest stockholder in a new company to be incorporated under the laws of Michigan, for the purpose of building electric railways in different parts of this and other countries. The new corporation is called the Short Electric Railway Company, and it has filed its articles of incorporation at the County Clerk's office in Detroit. The capital stock is $1,000,000 in 40,000 shares, of which 14,860 shares are held by the Brush Electric Company. The other stockholders are Sidney H. Short, of Cleveland, 2,500; N. B. Abbott, of Columbus, O., 2,000; James J. Tracy, of Cleveland, 10; George W. Stockly, of Cleveland, president of the Brush Electric Company, 10; C. F. Brush and J. Potter, of Cleveland, 10 each. The only Michigan stockholder is Wells W. Leggett, of Detroit, who is credited with 100 shares. It is further stated in the articles that the stock subscribed for is paid in full in cash, and by the transfer to the company of valuable rights and franchises which are regarded as worth $500,000. Its central business office will be in Detroit.—*Cleveland Leader.*

PERSONALS.

Col. H. G. Prout, editor of the *Railroad Gazette*, contributes to the September *Scribner* the last of the railway articles, his topic being "Safety in Railway Travel."

Dr. L. B. Fletcher has an interesting illustrated article in the September *Frank Leslie's Monthly* on "Electric Railways and Electric Motors," written in a clear and popular manner.

Prof. H. A. Rowland has an interesting paper in the July issue of the *American Journal of Mathematics* on "Electromagnetic Waves and Oscillations at the Surface of Conductors."

Prof. E. Loomis, who died last week, was engaged at one time in determining the difference of longitude between New York and other cities with the aid of the telegraph, and it was in this way that definite ideas were obtained by him as to the velocity of the current.

Mr. T. D. Lockwood, electrician of the American Bell Telephone Company, who has been on a long and well-earned vacation in Europe, returned home last week by the "City of Rome." Mr. Lockwood has not only regained his health, but has developed considerable talent as a poet, and bids fair hereafter to be known as one of the singers of the high seas.

Mr. W. D. Sargent, who has had charge of the American Bell telephone exhibit at the Paris Exposition, has returned home. Mr. Sargent has given close attention to the telephone in Europe. He visited, besides Paris and London, Neuchatel, Basle, Berne, Heidelburg, Mayence, Cologne, Brussels and Antwerp, and in a majority of these cities the wires were strung over the housetops. He predicts that the Bell telephone and the Edison exhibits in the United States section will get the highest award—the diploma of honor; that the Elektron Manufacturing Company will get a silver medal, and the Western Electric Company a gold medal.

MISCELLANEOUS NOTES.

An Electric Wire Fence has been run for 30 miles around the "L. X." ranch in Carlson County, on the Southern Kansas Railroad.

The Marquette, Mich., Electric Company are putting in a pair of 40-inch twin Leffel improved turbine water wheels to develop 350 h. p. The manufacturers, Messrs. James Leffel & Co., Springfield, O., report a steady demand for their specialty.

"Electrical Distribution" is the name of a pamphlet issued by the United Electrical Engineering Company, Limited, of London, dealing with their apparatus for the supply of direct and alternating current. It contains also a variety of interesting data.

No Electric Deaths in Rochester, N. Y.—A correspondent in Rochester writes us flatly denying the statement in Mr. H. P. Brown's pamphlet that three employés of the electric light company there have been killed by electricity. He says: "It is false. There never has been a single person killed in this city by an electric current of any kind."

The Electrical Supply Company, of Chicago, are making quite a specialty of furnishing fuse wire, having arranged to manufacture it cheaply and in large quantities. They find a very ready market for it. It is remarkably accurate. A price list giving amperage, length, etc., can be obtained from the company.

Carnot and Edison.—A cable dispatch from Paris of July 25 says: President Carnot almost daily visits the great exposition. While in the machinery gallery yesterday he was met by Mr. Franklin and staff of the American section. The latter received cordial greetings from the French President. He is greatly interested in the American exhibit, especially in Edison's wonders.

Japanese Orders for Engines.—The Woodbury Engine Company, of Rochester, N. Y., write us that of orders for nine of their high-speed engines and tubular boilers received by them from Japan during the past twelve months, the last was the quickest in transit. It was mailed in Yokahama July 8, reached San Francisco July 23, and Rochester, N. Y., July 29, making the entire distance of 9,115 miles by land and water in 21 days.

Edison in Europe.—Special dispatches from Europe state that Mr. Thomas A. Edison, accompanied by Mr. Russell Harrison, ascended the Eiffel Tower on Aug. 13 and took luncheon at the summit. A number of artists from the Opéra were present and sang into a phonograph, which afterward reproduced their airs. It is stated that the Queen has sent Colonel Gouraud to Paris to present to Mr. Edison a phonograph into which she has spoken, warmly congratulating the great American inventor. King Humbert has appointed Mr. Thomas A. Edison a grand officer of the Order of the Crown of Italy.

The Telephone Convention.—As we go to press, General Barney advises us that on Monday, Sept. 9, the compliment of a drive around Chicago and through the parks will be tendered to the delegates to the Minneapolis convention. At Minneapolis, on Thursday, Sept. 12, a carriage drive will be taken around the city at 9 A. M. for one hour, and then train will be taken for Minnehaha for lunch. Later, train will be taken for Fort Snelling, near St. Paul; then there will be a carriage drive for one and one-half hours around St. Paul, winding up with a banquet at the Ryan Hotel. Mr. Levi Sprague, president of the Northwestern Telephone Exchange Company, tendering these hospitalties to the delegates.

Is Electricity Dutiable?—A special dispatch from Washington of Aug. 10 says: Solicitor Hepburn, of the Treasury Department, has been called upon to decide an interesting question in regard to the introduction into the United States of electricity generated in a foreign country. It seems that several men have established an electrical plant at Niagara Falls, on the Canadian side, and propose to extend their wires to Buffalo for purposes of illumination, etc. Before doing so, however, they desire to know whether the electrical current thus transmitted into the United States would be subject to duty or other tax. It is believed that the solicitor will evade the question by informing the persons interested that it is contrary to the rules of the office to answer hypothetical questions of this character.

The "Volt" Defined.—The Chicago *Tribune* in explaining to its readers the technical terms used in electrical science gives the following beautiful definition of the volt: "A volt is the unit or standard of electromotive force. European electricians call it an 'element.' It is the parts of which an electric battery is constructed, and consists of plates of zinc, copper, or prepared carbon, which are immersed in a liquid containing one of a limited number of acids employed for the purpose of generating electricity by contact with the metal or carbon. A battery consists of a number of volts, the number varying with the strength of the electric current to be generated. The term 'volt' is formed from the same as Volta, the Italian scientist whose name is prominently connected with the development of electric science."

Cincinnati Corrugating Company.—Mention was recently made in this journal of the sale of the building, engine, etc., of the Cincinnati Corrugating Company, on Eggleston avenue, Cincinnati, Ohio, but we learn that this is merely one step in the important move the company is making toward occupying their new works at Piqua, Ohio. Among the new features of the business will be the manufacture of iron and steel sheets for their roofing, etc., under their own auspices. The large tract of land acquired just south of the flourishing city of Piqua will enable the two companies interested to extend their lines of specialties in many desired directions. The manufacture of all the sheet metal used by the company under their own immediate supervision is an advantage not easily estimated in securing a uniform and superior quality.

Wires in Cincinnati.—Prof. Thos. French, Jr., Consulting Electrician, at the last meeting of the Board of Public Affairs, presented an official communication advising the board to send printed copies of the electrical rules and regulations to the several electric companies, telegraph and telephone companies, to the fire and police departments, etc., so that they may be properly informed on the subject. All future constructions for light and power must conform to these rules. "As to the old constructions, it is (in his judgment) impracticable to require that these shall be made to conform in every particular with the present rules and regulations. A due regard for the safety of life and property, however, demands that various improvements be made in the old works with the least possible delay." The rules provide that wires shall nor sag unduly nor come into contact with signs or other neighboring objects; that insulating tubing be used where wires enter a building, and that a suitable cut-out switch be placed where wires enter and leave a building. He recommends that the fire department be made fully acquainted with the electric rules as a measure of public safety, and that fire-gongs be placed in every electric station of power and light at their owners' expense. Also that old constructions must conform to the rule requiring service wires to run horizontally from street mains to buildings. Upon recommendation of Prof. French, Mr. R. S. Finch, advanced student at the University, was appointed as his assistant in inspecting, making tests etc., the work of which is rapidly increasing, at a salary of $50 per month.

BUSINESS NOTICES.

Battery Cut-Out.—Attention is called to a simple device for disconnecting gas-lighting batteries if accidently grounded. It is cheap, sensitive, never needs watching, and has no clockwork to be kept wound. Terms furnished by the Electric Supply Company, of Syracuse, N. Y., No. 105 South Warren street.

The Electrical Supply Company, of Chicago, have recently manufactured a new line wire, which they call their "Shield" brand moisture-proof line wire. It is their intention to have this a a very superior quality of line wire, suitable for high insulation arc systems, alternating work, and where a wire passes through foliage, etc.

Patterson, Gottfried & Hunter (Limited), 146-148 Centre street, carry a complete stock of Brush copper, celluvert fibre oiled paper, hard rubber, rod and sheet brass, brass, copper and iron wire, self-hardening tool steel, set and cap screws, machine bolts, machine and wood screws, taps and dies, files and twist drills blowers and forges, machinery, tools and hardware, gear wheels wood pulleys, shafting hangers and belting. General factory supplies.

The Anglo-American Electric Light Manufacturing Company.—That success has been achieved in the development of commercially successful electric storage batteries, is evidenced by the results shown by the Anglo-American Electric Light Manufacturing Company, of 429 and 431 West 13th street, New York City. Though of comparatively recent organization, they have already attained a deservedly enviable reputation in the scientific world, while practically they have in active operation a large number of their storage cells, demonstrating clearly and beyond any question every claim made for them, one of the most important being in regard to their life, which the Anglo-American Electric Light Manufacturing Company is willing to guarantee as at least three years, and they also agree to maintain their cells in perfect working order for *ten years*, for an annual payment of ten per cent. of their cost.

While the Anglo-American Electric Light Manufacturing Company are at present manufacturing but one style of cell, Type. A 150 ampère-hours, they can construct them of any required size. Owing to the peculiar construction of the plates they cannot buckle, and the active material is so treated after its application to the plates—a method peculiar to the Anglo-American Electric Light Manufacturing Company—that it will not scale or drop out. The foregoing faults (buckling and scaling) and their consequent short circuiting have always been vital drawbacks to the perfection of all other storage batteries entailing, as they do, constant supervision, taking down, scraping, washing and straightening the plates. The Anglo American Electric Light Manufacturing Company are willing to guarantee that during the entire lifetime of their storage cells they will require no attention other than that necessary to replenish the solution in the cells as it evaporates.

The size of the 150 ampère-hour cell is 6¼ by 6⅝ inches, each cell containing 8 plates six inches square so constructed of ⅛-inch ribbon lead, that every plate exposes to the action of the electric current more surface than is obtainable in any other form of plate; therefore, the Anglo-American Electric Light Manufacturing Company are able to store in these 8-plate cells more current in ampère-hours than other storage battery companies are able to get into 19-plate cells of similar dimensions.

The great economy in the use of the Anglo-American Electric Light Manufacturing Company's storage battery, is proven by the established fact, that it can be charged and discharged in two-thirds of the time required by any other storage battery in existence, thus reducing the running cost of either large or small plants. Their percentage of loss is phenomenally small, as 92 per cent. of the current stored in these cells can be taken out; and, according to expert tests made by disinterested parties, they will return 86 per cent. of the energy put into them. Their internal resistance is only .003 of an ohm, and they possess for each pound of weight a capacity of five ampère-hours.

Mr. John Storer, Superintendent of the Schermerhorn Building, 96 Broadway, N. Y. City, where the Anglo-American Electric Light Manufacturing Company have a plant in operation, writes:

SCHEMERHORN BUILDING, 96 Broadway, July 24, 1889.

The Anglo-American Electric Light Manufacturing Company, 429 and 431 West 13th street, N. Y. City.

DEAR SIRS: I take pleasure in indorsing the work of your battery put in this building May 20.

In every respect it has exceeded the claims made for it, and is saving us two and a half hours running of engine and dynamo each day, a half a ton of coal each week, and our gas bill is reduced proportionate to the amount of lights we are wired for!

We have never had the slightest trouble with it, and we have taken from it its rated capacity, every night for the past thirty-three nights, and on Sundays from thirty-three and a third to fifty per cent. in excess. Yours very truly,

Signed, JOHN STORER, Supt.

The Anglo-American Electric Light Manufacturing Company's storage batteries are designed for use in house and town lighting, and for furnishing power in factories, as well as for propelling and lighting street cars.

Active preparation is now in progress by the Anglo-American Electric Light Manufacturing Company, for the purpose of practically demonstrating the great value of this battery for the purpose of propelling street cars.

Possessing a storage battery of acknowledged commercial value—proven so by practical use—and officered by men well known in financial circles, success was assured to the Anglo-American Electric Light Mananufacturing Company from its inception, and that their output of storage batteries up to the present time has been large, considering their comparatively recent organization, certainly emphasizes the fact of the great value of the patents held by the Anglo-American Electric Light Manufacturing Company, covering the Sorley storage battery. Subsidiary companies have already been formed and are in process of formation, throughout the East and West, one of the large Western interests of this company being represented by the Illinois Anglo-American Storage Battery Company, with offices at 95 Dearborn street, Chicago. This of course assures to the parent company a permanent and exceedingly profitable business.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS ISSUED AUGUST 6, 1889.

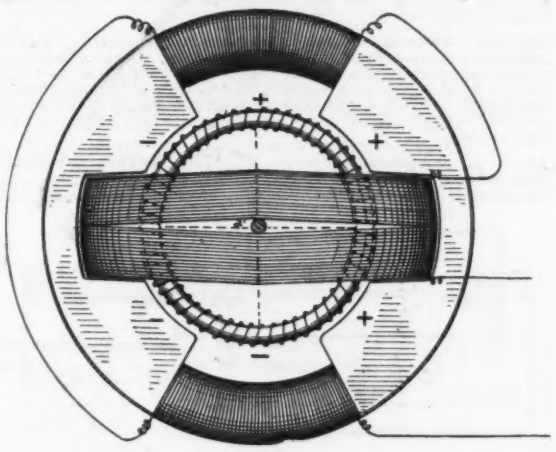
(1) 408,205. Regulator for Dynamo Electric Machines; (2) 408,206. Dynamo Electric Machines; Hermann R. Boissier, of New York, N. Y. Application filed Oct. 17, 1888. The combination of a shunt wound dynamo electric machine, a line circuit leading therefrom, translating devices in said line circuit, a circuit in series with the shunt coils of the dynamo, one or more resistances, a switch having an adjustable weight to insert or remove said resistances in the shunt circuit of the dynamo, and an automatic electro-magnetic regulator, consisting of two or more helices in parallel circuit having movable and separate cores connected to the switch for actuating said switch upon varying the line resistance arranged in circuit with the line. (2) An armature for a dynamo electric machine or motor, consisting of a suitable magnetic core wound with four complete coils of wire, in which all active parts of the same coil are located upon the core to one side of a plane passing through its axis, a commutator made in four sections, and connections for coupling the coils in series and uniting their terminals in pairs to separate sections of the commutator.

408,224. Individual Call for Telephones; Willard Eddy, of Haddam, Conn. Application filed Nov. 12, 1888. A system of guides, a switch-pin, which is movable therein through three separate courses of unequal lengths, and an electric motor actuating the pin, in combination with an alarm which is excited when said pin reaches a certain position in the shortest of said courses.

(1) 408,231. Means for Propelling Vehicles by Secondary Batteries; (2) 408,232. Means for Propelling Vehicles by Secondary Batteries; William W. Griscom, of Haverford College, Assignor to the Electro Dynamic Company, of Philadelphia, Pa. Applications filed (1) April 5, 1889; (2) April 12, 1889. It consists in placing one or more motors upon a car having seats for passengers, and mechanically connecting these motors with the wheels or axles in the usual manner. The batteries are placed upon a second four-wheel vehicle, which is mechanically connected to the first vehicle and drawn thereby. The batteries on one vehicle are electrically connected to the motors on the other, and a switch for controlling the electrical connections is placed upon the first car.

408,265. Commutator for Electric Machines; Sidney H. Short, of Columbus, O Application filed Oct. 9, 1888. Upon the outer faces of the segments are fastened extra wearing segments, which may be replaced when worn out.

408,279. Zinc Electrode for Galvanic Batteries; James B. Williams, of Oakland, Cal. Application filed Dec. 12, 1885. A zinc for galvanic batteries, provided with a cavity to contain mercury entirely within the zinc, and having a canal extending obliquely in an upward direction from near the bottom of the cavity to a point on the surface of the zinc which is below the



408,641. ALTERNATING CURRENT MOTOR.

level of the battery fluid, and a canal extending in an upward direction from the upper portion of the cavity to a point on the upper surface of the zinc which is outside the battery fluid.

(1) 408,286. Manufacture of Incandescent Lamp Filaments; (2) 408,287. Secondary Battery; Turner D. Bottome, of New York, Assignor to John B. Tibbits, of Hoosick, N. Y. Applications filed (1) April 16, 1889; (2) May 28, 1889. (1) The process of reducing metallic compounds contained in carbon filaments to the metal, consisting in electrically heating the carbon in an atmosphere of pure, dry and heated hydrogen. (2) A storage pile consisting of a vessel composed of non-conducting material, wherein are placed alternate layers of a paste containing a large proportion of lead crystal, a paste of conductive non-soluble glue and a metallic plate coated on one side with palladium, and on the other with platinum or carbon.

408,295. Electric Meter; Sebastian Ziani de Ferranti, of Hamstead, County of Middlesex, England. Application filed Oct. 10, 1888. In an electric meter, the combination, with the stationary coils of an unwound rotating armature magnetized thereby, said armature being built up of insulated laminæ of iron or magnetic metal, and the mass of metal being so related to the resistance of the coil that the current in the coil cannot magnetically saturate the armature.

408,327. Telephone System; John R. Smith, of Neosho, Mo., Assignor of three-eighths to Luther A. Young and Henry J. Curtice, of same place. Application filed Feb. 16, 1888. In this system any number of persons may be operating at the same time without interfering with each other, and make their connections and disconnections by means of electricity.

408,333. Governor for Electric Motors; George H. Whittingham, of Baltimore, Md. Application filed Oct. 9, 1888. The combination with the field magnet of an armature of an electric motor, of a series of contact plates arranged on each pole of the field magnet and electrically connected with the layers of the coils thereof, and an intermediate shunt arm electrically connected with the opposite series of plates and mechanically connected with a governor arranged to receive motion from the shaft of the armature.

408,334. Device for Suspending Electric Conductors; Thomas E. Adams, of Cleveland, O. Application filed Jan. 9, 1889. The combination, with an insulator pin provided at its lower end with an elongated concave seat, having a recess or depression formed between the ends of said seat, of a clip constructed and arranged to encircle the seat and retain a conductor in contact therewith.

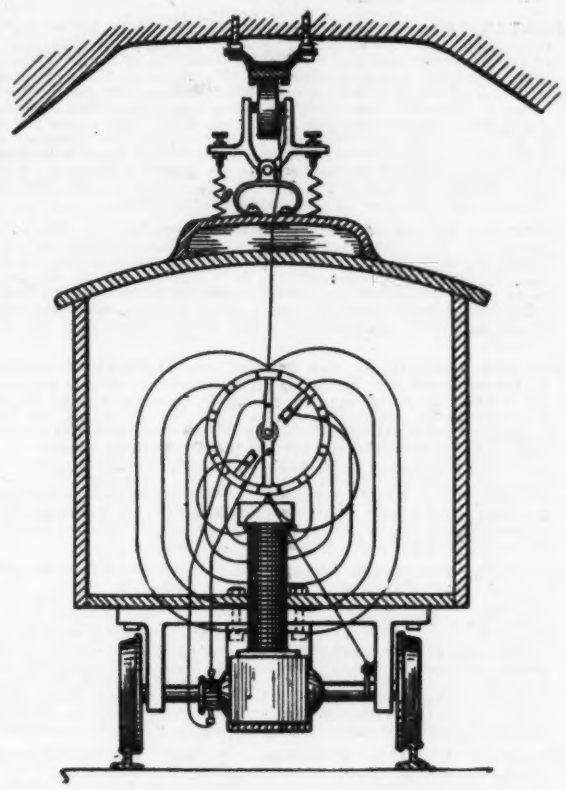
408,358. Carbon for Electric Lighting; Carl Anton Schroeder, of London, England. Application filed May 15, 1888. Patented in England April 26, 1888; in Germany May 12, 1888; in France May 29, 1888, and in Belgium June 23, 1888. The process of treating carbon electrodes for arc lights, which consist in first impregnating the carbons with a dilute solution of calcic chloride and then treating the same with a potassium compound which is soluble in water, or its described equivalents, this being done partly with wet solutions, but principally with fused materials.

408,367. Secondary Battery; Nathaniel B. Aldrich, of Fall River, Mass. Application filed Aug. 25, 1888. In carrying out the process, the supports, frames or plates are coated with iron, zinc, tin or copper. This is accomplished by the electrolysis of a solution containing one or more of the metals mentioned. The next step in the process is to deposit a layer of lead upon the plate after it has been coated as above stated. This deposit is accomplished by the electrolysis of a solution of any soluble lead salt. The deposit thus made will be combined to a greater or less extent with the iron, zinc, tin or copper coating which the plate first received. This deposit of lead is then to be converted into active material. See illustration.

(1) 408,374. Method of Incasing Tubing Composed of Plastic Materials; (2) 408,375. Lead Press; (3) 408,377. Lead Press; Henry B. Cobb, of Wilmington, Del. Applications filed (1) October 5, 1888. (2) October 5, 1888. (3) November 1, 1888. (1) The invention consists in molding upon the plastic tubing while passing through a die a close-fitting metal shield, and causing a fluid to pass through the tubing during the operation of molding the shield. (2) In a lead press, the combination of a reciprocating lead cylinder, a stationary hollow plunger in line with and above the lead cylinder and a stationary mold above the plunger and communicating therewith. (3) In a lead press, the combination of a core tube, and a die, having a passage between them, and a perforated tube surrounded by a water jacket within the die.

408,367. SECONDARY BATTERY.

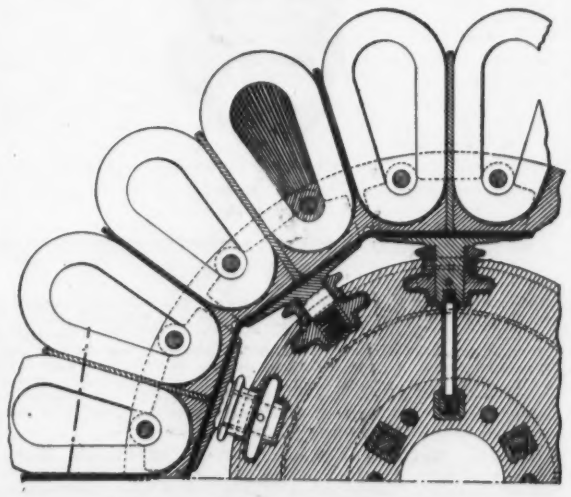
408,383. Line Wire Insulator; Carroll G. Graham, of Marion, Ia. Application filed Jan. 26, 1889. An insulator having an internal convex surface, a diametrical notch in its top, admitting the line wire thereto in diagonally opposite recesses, forming an oblique passage through the insulator below solid overlying portions thereof, and provided with a pair of pivots below said convex surface and in line vertically with said recesses, respectively.



408,544. ELECTRIC RAILWAY SYSTEM.

408,403. Dynamo Electric Machine; Sebastian Ziani de Ferranti, of Hamstead, County of Middlesex, England. Application filed Nov. 30, 1888. Patented in England, Jan. 15, 1887. An armature for a dynamo-electric machine, composed of a number of coils arranged around the circumference of a disc or wheel, and each formed from a corrugated or interlocking strip of metal, so that the several layers of the coil interlock with one another. See illustration.

408,404. Dynamo Electric Machine; Sebastian Ziani de Ferranti, of Hamstead, County of Middlesex, England, Application filed January 14, 1889. Patented in England, February 15, 1888. A dynamo electric machine having a driving pulley carried between two bearings in which the wheel shaft is supported, and an armature carried by the rim of said pulley at one side of its driving surface.



408,403. DYNAMO ELECTRIC MACHINE.

408,484. Electric Lock; Louis Huebner and Rudolph Busse, of Schweidnitz, Germany. Application filed November 23, 1888. Patented in Germany, January 3, 1888. The tumblers are operated by electricity.

408,503. Trolley Track; James H. Morley, of Florence, Assignor of one-half to George Nightingale, of Holyoke, Mass. Application filed Feb. 15, 1889. The invention consists in a track consisting of a single "double-headed" rail adapted to be suspended from an overhead support, and in a carrier, the wheels of which are adapted to bear upon the inner side of the head of said track upon opposite sides of the web which unites said head to the base.

408,513. System of Electrical Distribution; Frank L. Perry, of Chicago, Ill. Application filed Aug. 27, 1888. The combination of a single main line circuit having various devices for electrical translation connected up therewith, and a station switch in connection with any such device or a group thereof to automatically control the electrical supply thereto by reversal of the line current, the same comprising an electro-magnet closed to line and having terminals of like polarity, an isolated polarized armature pivoted in the field thereof, and a bridge piece controlled by said armature to make and break the line connection of the translating device or group.

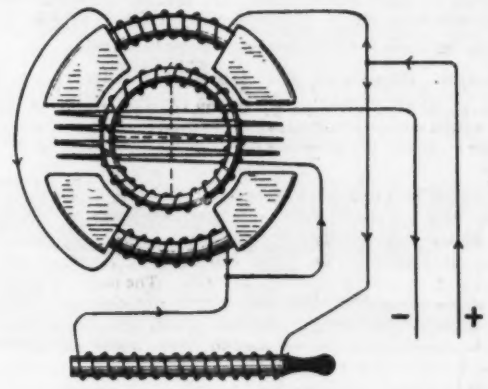
408,544. Electric Railway System; Frank J. Sprague, of New York, N. Y., Assignor to the Sprague Electric Railway and Motor Company. Application filed Feb. 27, 1885. In an electric railway the combination, with a car and an electric motor mounted upon and propelling it, of an overhead conductor, a contact device carried by the car and traveling on the under side of said conductor, and a rocking support for said contact device whose normal position is vertical. See illustration.

408,574. Method of Introducing Molten Insulating Material into Underground Conduits; David Brooks, Jr., of Philadelphia, Pa., Assignor to the Electric Cable Construction and Maintenance Company, of Pennsylvania. Application filed Jan 21, 1889. The method of introducing insulating or other material into a conduit for electric wires or cables, consisting in first heating the conduit and then passing the material simultaneously with the wire or cable from the containing tank into the conduit.

408,590. Electric Motor; Stanley C. C. Currie, of Philadelphia, Pa. Assignor to the United Electric Improvement Company, of Gloucester City, N. J. Application filed Oct. 9, 1888. The invention consists in the provision of means whereby, in a motor having more than two brushes adapted to contact with the commutator, the brushes may be successively thrown into, or out of, contact with the commutator to increase or decrease the power of the motor.

408,600. Insulating Coupling for Pipes; Erick E. Erickson, of Boston, Mass., Assignor of one-half to Winthrop Thayer, of same place. Application filed March 5, 1889. An insulating pipe coupling consisting of two internally threaded metallic sleeves and a connecting piece, of hardened plastic insulating material, in which said metallic sleeves are embedded, separated from each other, said insulating connecting piece having a hole between the sleeves.

408,607. Electrical Drinking Vessel; Frederick W. Flint, of Mount Airy, Ga. Application filed May 6, 1889. The invention consists, essentially, in a vessel constructed partly or wholly of non-conducting material, the vessel being adapted to contain a liquid or beverage, and provided with a suitable connection whereby its contents may be connected with one pole of a battery, in such manner that the vessel, in connection with the fluid therein, will form an electrode, whereby the electric current will be conducted to and distributed throughout the surfaces with which the fluid comes in contact in the act of swallowing the same.



408,641. ALTERNATING CURRENT MOTOR.

408,629. Method of Producing Battery Solutions; William P. Kookogey, of Brooklyn, Assignor to the Kookogey Electric Company, of New York, N. Y. Application filed June 7, 1887. The method of producing chromic battery solution, which consists in adding to water (preferably heated) bichromate of soda, and adding to this mixture sulphuric acid, allowing the mixture to stand until the sulphate of soda is precipitated, and then siphoning off the liquid.

(1) 408,638. Contact Arm for Electric Railway Motor Cars; (2) 408,639. Underground Conduit for Electric Railways; (3) 408,640. Multiple Motor Electric Locomotive; (4) 408,641. Alternating Current Motor; (5) 408,642. Inductional Electric Motor; Charles J. Van Depoele, of Lynn, Mass. Applications filed (1) April 2, 1889; (2) June 24, 1889; (3) June 27, 1889; (4) July 5, 1889; (5) July 13, 1889. (1) In electric railways, a contact arm carrying a contact device at its free extremity and hinged at or near its lower end in a support adapted to be mounted upon the roof of a car or vehicle, and a plurality of tension springs connected to the lower part of the arm and to its support and coacting under tension to impart upward pressure to the free end thereof. (2) A conduit for electric railway conductors, comprising a slotted exterior conduit, an interior insulating conducting support and a slitted flexible casing or cover attached to the conductor support and within the conduit. (3) An electrically-propelled vehicle provided with sets of driving wheels rigid upon their axles, electric motors vertically mounted directly upon said axles and extending upwardly therefrom and radially movable thereon, driving gears upon the axles, driving pinions upon the armature shafts of the motors in connection with the driving gears upon the axles and buffer springs for limiting the oscillations of the free ends of the motors. (4) An electro-dynamic motor, comprising a wire-wound armature, means for connecting the armature conductor into one or more closed circuits, an adjustable resistance in the circuit or circuits across the armature, a stationary coil for inducing currents in the armature and a suitable field magnet for reacting upon the resultant armature poles. See illustration. (5) An electro-dynamic motor, comprising a suitable field-magnet system, energized by alternating or intermittent currents, and an armature rotatively mounted within the field of force and having a plurality of windings upon its core, a sectional commutator and connections between the sections of said commutator and a portion of the armature coils, and a suitable circuit spanning the commutator brushes, the remaining armature coils forming a circuit or circuits closed upon themselves.

408,647. Electrical Resistance; Francis O. Blackwell, of New York, N. Y. Application filed June 5, 1889. In an artificial resistance the combination, with an inclosing box, of a circular series of plates in contact with one another, and one or more filling pieces to compensate for the difference between the internal and external peripheries of the series.

408,465. Method of Magnetically Reducing Friction; Mark W. Dewey, of Syracuse, N. Y., Assignor to the Dewey Corporation, of same place. Application filed June 6, 1889. Consists in subjecting the bearing parts to a magnetic force tending to separate them or reduce the pressure between the bearings, and thus prevent undue wear, heat, and waste of energy, and also reduce greatly, if not entirely, the consumption of oil or other lubricants.

408,666. Secondary Battery; James F. McLaughlin, of Philadelphia, Pa. Application filed April 29, 1889. In a secondary or storage battery, an electrode composed of plates of lead or other material held a suitable distance apart, with lead tubes extending between and through the plates, and a core of baked active material within each tube.

408,468. Magneto Electric Individual Switching Apparatus; John W. Dunlap, Sr., of Pittsburgh, Pa., Assignor, by Direct and Mesne Assignments, of part to Robert J. Shaw, Charles R. Mail and Willis H Rowe, all of same place. Application filed Aug. 1, 1888. A combined transmitter and receiver pendulum, consisting, essentially, of a pair of springs, the lower ends connected with the respective end wires of a wire-wound bobbin, provided with suitable checks supporting a graduated rod with needle and sliding weight, in combination with a pair of magnets with equal poles, and lever contacts constructed to fall on the oscillation of the pendulum.

408,671. Railway Signal; Joseph W. Riggs, of St. Paul, Assignor to the Riggs Electric Traveling Danger Signal Company, of Minneapolis, Minn. Application filed Sept. 13, 1888. In a railway signal, a compound conductor consisting of three parallel flat bars or plates placed edgewise in sections and embedded in an insulating material except at their upper exposed edges, one bar or plate of each section having its terminal at the end of said section, the second bar or plate having its terminal at the end of the second section, and the third bar or plate having its terminal at the end of the third section.

408,676. Electrical Call Bell; Thomas J. Smith, of Brooklyn, N. Y., Assignor to the E. S. Greeley & Co., of New York. Application filed Dec. 14, 1888. By means of the construction the bell is carried by the frame containing the operative parts, and the apparatus, when the frame is dismounted, can be tested without remounting, while the circuit wire binding posts may always remain undisturbed when the frame is dismounted and remounted.

408,678. Electric Switch; Walter Thompson, of Orange, N. J. Application filed April 24, 1889. A switch, combined with a bed having terminals of an electric circuit secured thereon and projecting toward one another at approximately right angles to a sliding bar and overlapping one another, the sliding bar interposed between the overlapping terminals and provided on opposite sides thereof with opposite inclines which unite at a point or apex.

U. S. PATENTS ISSUED AUGUST 13, 1889.

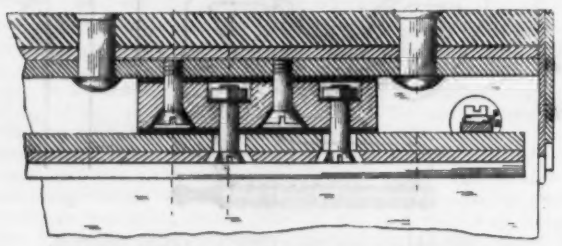
409,015. Electric Welding; Charles L. Coffin, of Detroit, Mich. Application filed April 24, 1889. The process of welding metals which consists in placing them in an air tight chamber, exhausting the air therefrom, and then fusing the metals by electricity. By thus conducting the operation in vacuo a current of less energy is required than when the operation is performed in the open air, and oxidation or scaling is largely prevented.

409,088. Alarm; Gwilym M. Williams, of Wilkesbarre, Pa. Application filed Feb. 4, 1889. In an electric alarm for pressure gauges, the combination, with a rigid plate, of a plate hinged thereto, provided with upwardly projecting corresponding lugs disposed at each end thereof, and having opposing contact points.

409,097. Insulated Nippers and Cutting Instrument; Firmin Michael Casey, of Mount Vernon, N. Y. Application filed Jan. 27, 1887. Nippers having handles covered with a vitreous insulating material.

409,104. Conduit Electric Railway; Byron Jennings, of San José, Cal. Application filed Dec. 4, 1888. An electrical rail having its upper surface channeled, and having the ends beveled or inclined, as shown in combination with a conductor fitting the groove or channel and bent downwardly to form an arc or curve between the adjacent ends of the rail sections.

409,106. Electrode for Secondary Batteries; William Prescott Kookogey, of Brooklyn, Assignor to the Kookogey Electric Co., of New York, N. Y. Application filed Dec. 26, 1888. The invention consists in general of the combination of the supporting plate of some solid material which is not destructively acted upon



408,855. ELECTRIC RAILWAY.

by the acid of the battery, and which has a low difference of potential with lead, such as wood, such plate being pierced with openings, into which the active material or the material intended to be made active is placed, the two plates being held tightly together.

409,116. Motor for Street Cars; William H. Patton, of Englewood, Ill., Assignor to the Patton Motor Company, of Pueblo, Col. Application filed February 25, 1889. The object of this invention is to provide an improved driving power for motors of this class, which will enable the gas engine or other motive power to be run continuously and at a high rate of speed in relation to the speed of the cars, for driving a dynamo.

409,135. Electrical Resistance; Edward M. Bentley, of New York, N. Y. Application filed June 5, 1889. It consists in a resistance box provided with a contact arm moving about a centre, so that its outer end, to which the contact piece is attached, moves in the arc of a circle. The box is made of such a width that, although it has not a circular form, the contact piece is always in engagement with the edges of the plates at any point.

409,136. Means for Preventing Incrustation in Steam Boilers; Samuel G. Cabell, of Washington, D. C. Application filed June 25, 1889. The invention consists, essentially, in a hollow vessel or core, and a plurality of magnetic points or projections extending into and across the space within the walls. The feed-water passes through the magnet on its way to the boiler, and prevents scaling in the boiler.

409,146. Electric Railroad Signal; William F. Grassler, of Williamsport, Pa., Assignor of three-fourths to C. C. Gibson, W. G. Elliott and W. B. Updegraff, all of same place. Application filed Nov. 20, 1888. In an electric railway signal, the combination of a series of locomotives, each carrying an electric generator, alarm, and insulated contact brushes, with an insulated continuous conductor in the path of the contact brushes, such conductor being provided at regular intervals along its length with deflections.

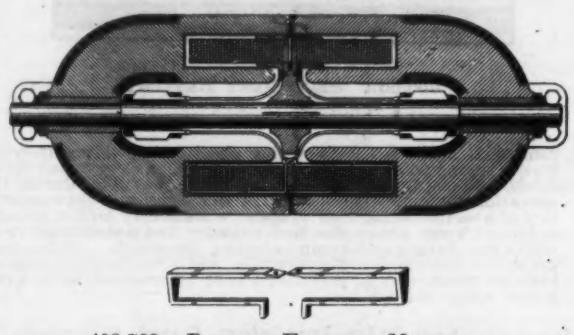
409,156. Double Suspended Conductor System for Electric Railways; Charles J. Van Depoele, of Lynn, Mass. Application filed April 13, 1889. A double suspended conductor system for electric railways, comprising positive and negative conductors following the line of each track, the conductors of one polarity over each track being arranged upon the inner sides thereof and electrically connected at intervals, the remaining conductors being parallel therewith but nearer to the outer sides of said tracks.

409,157. Harmonic Telegraphy; Francois Van Ryssel-berghe, of Brussels, Belgium, Assignor to the Phono-Multiplex Telegraph Company, of Baltimore County, Md. Application filed July 26, 1888. In a tone or harmonic telegraph, a magnet controlled by main line currents and a series of vibrators operated thereby, the vibrators being provided with adjustable weights to regulate their rates of vibration.

408,740. Filament for Incandescent Electric Lamps; Adolf F. Oppemann, of Chicago, Ill., Application filed April 11, 1889. The invention consists in subjecting the cotton thread to a high degree of pressure, so as to crush the fibre before it is carbonized, so as to avoid the distortion of the filament, heretofore resulting from the tendency of the fibre to untwist; also, in subjecting the carbonized filament to the action of an alternating current while the filament is surrounded by hydrocarbon gas, so as to make the coating or deposit thickest at the upper portion or curve of the filament.

(1) 408,753. Electric Motor for Street Cars Application filed Aug. 22, 1888. **(2) 408,754. Motor for Street Cars;** Application filed March 1, 1889. Wilbur S. Salisbury, of Chicago, Ill. (1) In a motor for street cars, the axle and a frame journaled thereon, in combination with an electric motor supported in said frame, the armature of which extends parallel with and in the same plane as the axle, and the field magnet cores of which straddle the axle, and a gear connection between the motor and axle. (2) The prime object of this invention is to provide an arrangement of motors upon the balanced frame and the gears connecting the same with the axle, whereby motors of greater speed and and power may be employed without detracting from the compactness of the mechanism or destroying the balance of the frame upon the axle.

408,762. Fire-Alarm Box; John Speicher, of Jersey City, Assignor by direct and mesne assignments, to the Newark District Telegraph Company, of Newark, N. J. Application filed Oct. 3, 1888. The object of this invention is to provide a fire alarm box more particularly for use in private houses, factories, and



408,768. DYNAMO ELECTRIC MACHINE.

like positions, supplemental to the ordinary alarm system, of a reduced cost of construction. The invention consists in improved details of construction.

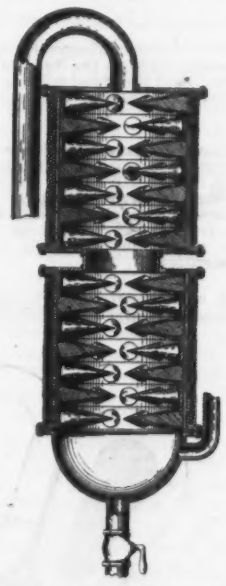
408,768. Dynamo-Electric Machine; Jean Theodore Van Gestel, of New York, N. Y. Application filed June 25, 1888. A dynamo electric machine having two field magnets of horseshoe type, said field magnets being joined together at their polar ends by scarf splices, and having interior projecting pole pieces in combination with an armature of the Gramme type carried on a shaft journaled at the neutral portions of said field magnets and adapted to rotate in the groove formed at the junction thereof, said armature having commutators at its opposite ends attached to the shaft, and commutator brushes connected together by a common connection and journaled by the frame of the machine, whereby said brushes may be adjusted conjointly.

408,785. Electric Gas Lighter; Theodore J. Zoeller, of Louisville, Ky., Assignor to himself, Daniel E. Doherty, B. D. Mattingly and C. J. Doherty, of same place. Application filed Dec. 10, 1888. The combination, in a gas lighter, of an electro-magnet, a permanent magnetic armature, a feed pipe having an orifice to discharge the gas, and a valve moving over said orifice to partially close the same while free from contact with the walls thereof.

408,809. Electrode for Secondary Batteries; Abraham V. Meserole, of New York, N. Y., Assignor of one-half to Henry A. Wilson, of Ridgefield, N. J. Application filed May 27, 1889. The invention consists of an electrode composed of an inner frame and outer plates united rigidly, said frame being provided with a series of vertically arranged ribs forming spaces or recesses for containing thin strips or filaments of lead or lead alloy arranged vertically therein, the electrical strength and capacity of the electrode being increased by the addition of these filaments, and said outer plates being provided at suitable intervals with a series of openings for the free access to and circulation about all parts of the electrode of the electrolytic fluid.

408,846. Automatic Signaling Device for Time Service; Chester Henry Pond, of Chicago, Ill., Assignor to the Self-Winding Clock Company, of New York, N. Y. Application filed May 3, 1889. The object of the invention is to provide means whereby the preliminary signals for the transmission of time over an electric circuit and the synchronizing or other correction of time pieces included in said circuit may be given with greater accuracy than heretofore. The combination of a main line having secondary time pieces included therein, the branch lines respectively connected with said branch lines, clock work for revolving said discs, and a line connecting said discs with said main line.

408,855. Electric Railway, William M. Schlesinger, of Philadelphia, Pa. Application filed May 29, 1886. Has for its object the construction of the conduit and conductors, and the couplings or connectors between the conduit sections and the conduc-



409,136. MEANS FOR PREVENTING INCRUSTATION IN STEAM BOILERS.

tors whereby the conduit sections and the conductors are free to independently or separately expand and contract under the influence of natural or other causes without affecting the strength or durability of the connections securing them together, free and quick access is obtainable to the couplings or connections between the conductor sections or lengths under all conditions of service for repairs or other purposes, as near perfect insulation for the conductors is obtained as is possible, and an economical and durable construction of line secured.

408,875. Method of Electric Metal Working; Mark W Dewey, of Syracuse, N. Y., Assignor to the Dewey Corporation, of same place. Application filed June 3, 1889. The method of metal working, consisting in creating electric stress or resistance in a continuous metal bar or blank by subjecting the blank at or near the part to be worked to magnetism, and simultaneously therewith passing through the blank, including the said part, an electric current of sufficient volume to soften the said part, and then bending, shaping, or otherwise working or treating the part.

408,887. Arc Lamp; James A. Lighthipe, of Philadelphia, Pa., Assignor to himself, George W. Bratton, of same place, and Henry Nunez, of New York, N. Y. Application filed June 19, 1888. An arc light regulator, consisting of a carbon carrier geared to a train of gearing carried on a pivoted frame, and also to a rotating armature located in the magnetic field of a regulating electro-magnet, with a fixed armature also attached to said frame and located in the magnetic field for establishing the arc.

408,901. Insulation for Electric Conductors; Charles T. Snedekor, of St. Louis, Mo. Application filed June 21, 1889. An insulating covering for electric conductors and other metallic substances consisting of a coating of alum-saturated fibre secured to the article to be insulated by shellac, a coat of varnish upon said fibre, a powdered non-inflammable coating upon said varnish, a fibrous coating filled with a paste compound of a mineral substance or substances, a coating of dry alum-saturated fibrous material, an asbestos covering, and an outer coating of varnish.

408,910. Electro-Dynamic Machine; George F Card, of Covington, Ky., Assignor to the George F. Card Manufacturing Co., of same place. Application filed July 31, 1888. In a governor for an electro dynamic machine or motor, a driving circuit having a normally open loop of low resistance wound upon the field magnet in contrary direction to the field's direct windings, one of said loop's terminals being attached to the vibrating member of a centrifugal regulator (connected to the armature shaft) so as to oscillated isochronously with varying speeds of the revolving armature between two opposing terminals of said loop.

408,948. Electric Arc Lamp; William H. Barker, of Lawrence, Kan. Application filed Nov. 12, 1888. The combination of the terminals of an electric arc lamp with a cut-out having contacts, one in connection with one terminal and the other with the other terminal, and the positive carbon carrying rod having at intervals, corresponding with the lengths of time the carbon is to burn, means for closing the cut-out.

408,968. Electro Mechanical Bell Striking Machine; Thomas F. Gaynor, of Louisville, Ky., Assignor to the Gaynor Electrical Company, of same place. The object is also to provide a machine, with a lock stop mechanism which will securely lock the moving parts of the machine in a stationary position when the machine is not striking a signal on the bell, and at the same time so constructing the lock stop mechanism that it will release the moving parts of the machine for operation with the least possible loss of time and expenditure of mechanical power, and also after a blow has been struck upon the bell by the hammer that the moving parts of the machine will be locked again as rapidly as possible, so that the machine will be ready to strike the next blow without loss of time.

408,984. Contact Carrier for Electric Railways; John C. Love, of Philadelphia, Pa. Application filed Nov. 30, 1888. The combination of the line conductors of an electrical railway, a contact carrier block, arms pivoted to the under side of said block and carrying contact wheels, and pull springs to press the said wheels against the line conductors.

408,986. Apparatus for Filling Secondary Battery Plates; Henry G. Morris and Pedro G. Salom, of Philadelphia, Pa. Application filed May 2, 1889. The combination of a frame of a press having upright bolts with a frame secured to one of said bolts, an annular frame supported by and free to turn on said fixed frame and having a series of holders, with grid-carrying dies adapted to said holders, the frame being so hung in respect to the plunger and platen of the press that the grids can be fed one by one between said platen and plunger.

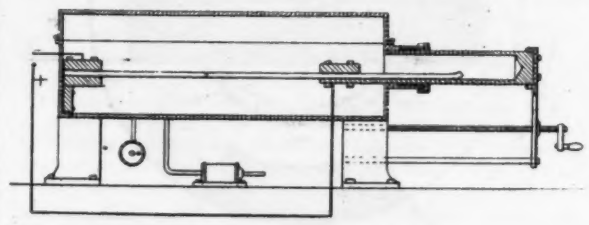
408,992. Alarm; John Matthias Schmidt, of Saginaw, Mich. Application filed Sept. 13, 1888. Consists in providing a cash register with an electric bell, battery and switch so connected with wire that the opening of the cash register will close the circuit, and thereby give a continuous alarm as long as the same is open, and that the closing of the cash register will open the circuit and stop the bell from ringing as long as it is closed.

PATENTS EXPIRED AUGUST 13, 1889.

130,353. Improvement in Galvanic Batteries; Frederick E. Beardslee, of Brooklyn, N. Y. The combination, in the formation of galvanic batteries, of the metal chromium as the negative element therein, with any suitable substance as the positive element therein.

130,362. Improvement in Plating and Coating Metals; Emile Eugenie de Lobstein, of Paris, France. The process of producing a coated metallic article by subjecting the article to be coated to a weak, cold solution of the required coating metal and to the action of a galvanic battery, and by subsequently subjecting the said article to the heat required to melt the coating.

130,385. Improvement in Electro-Motors for Sewing Machines; Abel T. McClure, of San Francisco, Cal., Assignor to himself, Thomas B. Shannon, George McDonald, George



409,015. ELECTRIC WELDING.

Stephens, Henry E. McBride, and Samuel D. Wood, of same place. Two sets of electro-magnets and arranged in sets of two pairs each, and having their armatures connected with the shaft at opposite ends by means of pitmen and crank wheels.

130,426. Improvements in Combined Telegraph Sounder and Relay; Charles H. Haskins, of Milwaukee, Wis. The employment in connection with the core of a main circuit electro-magnet of a constant local circuit of less power upon the core than the main circuit, which constantly magnetizes the armature and core of said magnet.

PATENTS EXPIRED AUG. 20, 1889.

130,593. Improvement in Galvanic Batteries; George M. Phelps, of Brooklyn, N. Y., Assignor to Western Union Telegraph Company. The zinc pole made of radial arms and ring segments upon the ends of such arms.

130,611. Improvement in Electrical Apparatus for Indicating Depth of Liquids in Tanks; Elery P. Warner, of Galesburg, Ill., Assignor of one-half his right to F. H. Tubbs, of same place. In combination with a tank and an electro-mechanical alarm signal, a float device for the purpose of closing the circuit and operating the signal when the tank is full.

130,612. Improvement in Electric Railway Signals; Elery P. Warner and John B. Odell, of Galesburg, Ill., Assignor of one-third their right to F. H. Tubbs, of same place. The invention is to indicate the departure of cars from a distant station at a station toward which the cars are moving, by means of an electro-mechanical signal, operated either by the cars or engine.

130,658. Improvement in Electro-Galvanic Quicksilver and Amalgam Saving Apparatus; Joseph Potts, of Treasure Hill, Nev. The object of the invention is to provide a means of saving quicksilver and amalgam in mining operations, especially that portion which usually escapes down the sluices on account of its fineness or state of subdivision. The method is by passing the pulp or tailing through a box sluice, or section of a sluice which is provided with peculiarly arranged riffles, the pulp or tailing being first distributed upon the floor or bottom of the sluice or box by means of a revolving hopper of novel construction.

130,661. Improvement in Electric Signaling Apparatus for Railroads; William Robinson, of Brooklyn, N. Y. A visual or semaphoric signal, in combination with a constant circuit, composed in part of a rail or rails of a railroad track.

130,662. Improvement in Embossed Telegraph Messages for Automatic Transmission; James H. Rogers and John W. Rogers, of Peekskill, N. Y. A sheet metal tape provided with raised letters or characters.

130,702. Improvement in Telegraph Wires from Alloys; Charles J. A. Dick, of Pittsburgh, Pa. Telegraph wires of alloys free from oxides, and composed of copper with from two to five and a half per cent. of tin.

130,770. Improvement in Apparatus for Lighting Gas by Electricity; Jacob P. Tirrell, of Charleston, Mass. A circuit breaker, located at the burner and operated automatically.

130,776. Improvement in Electric Railway Signals; Elery P. Warner and John B. Odell, of Galesburg, Ill., Assignors of one-third their right to F. H. Tubbs, of same place. An electric visual signal operated by means of passing railway trains or engines acting upon mechanism which displays the signal by shifting the current.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had for 25 cents. Give the date and number of patent desired, and address The W. J. Johnston Co. Ltd., Times Building, N. Y.